

NEW ZEALAND  
JOURNAL OF  
*Agriculture*  
MARCH - 1954

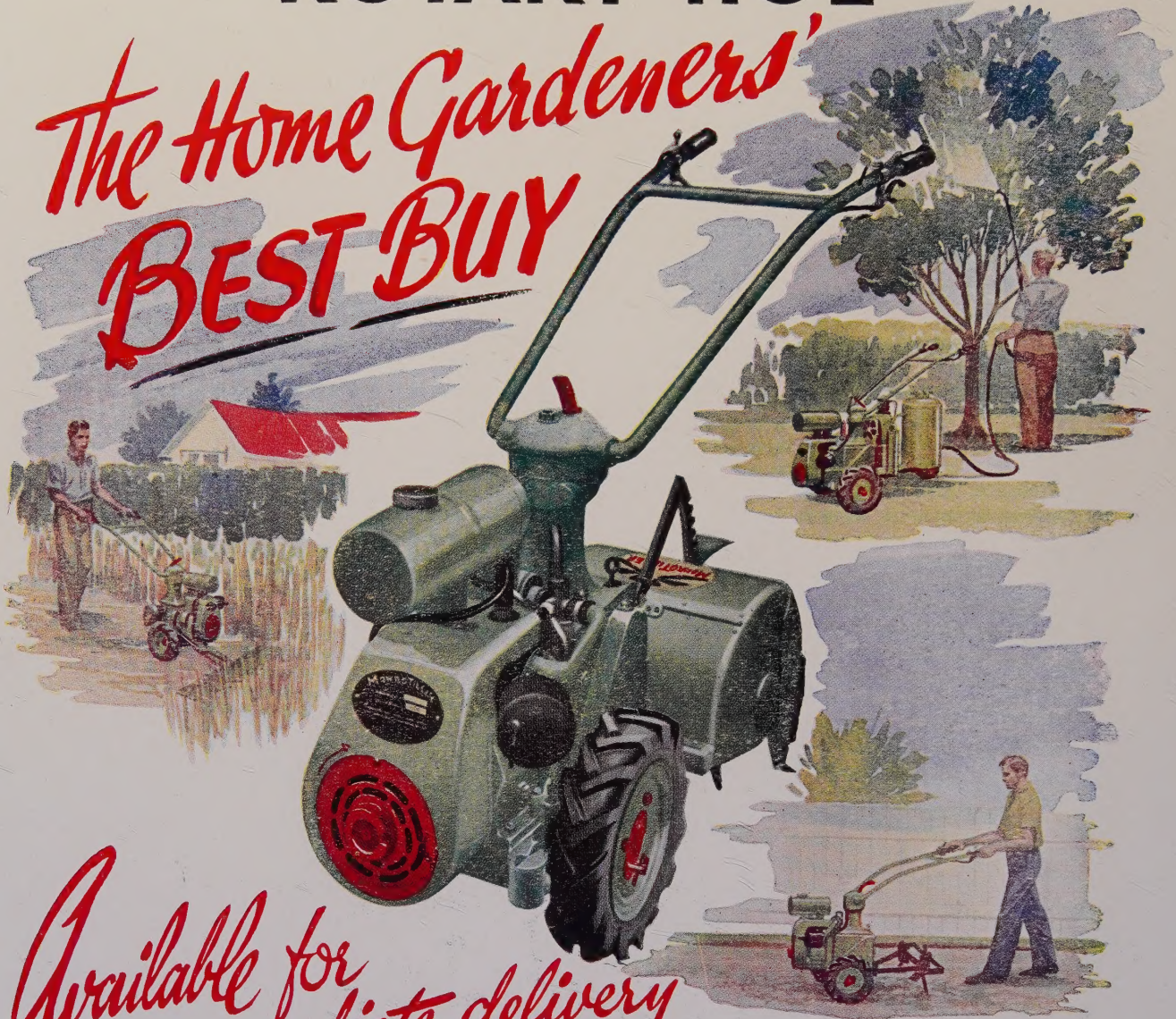




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Volume 88

Number 3

15 March

1954.

(Established 1910)

# NEW ZEALAND JOURNAL OF *Agriculture*

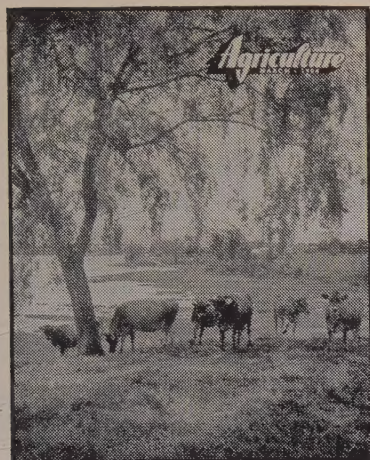
Published by

Direction

of

Rt. Hon. K. J. Holyoake,

Minister of Agriculture.



This month's cover, of cows grazing on coastal country near Tauranga, was reproduced from a colour photograph by D. R. Brenchley. Though the Tauranga district has a Dominion-wide reputation for its citrus and sub-tropical fruits, dairy farming has always been its most important farming activity. The Tauranga district enjoys long hours of sunshine, an adequate rainfall, and mild winters. Consequently there is a long season of pasture growth. As in other main North Island dairying districts hay and silage made from surplus grass growth are often the only supplementary feeds provided for herds.

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### SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 10s. a year; the overseas subscription is 13s. (sterling). The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available from Publications Section, P.O. Box 2298, Wellington, at 1s. a copy, post free.

Subscription inquiries (preferably accompanied by the address cut from a recent "Journal" wrapper) should be sent to the nearest office of the Department of Agriculture.

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## DAIRY FARM IMPROVEMENT

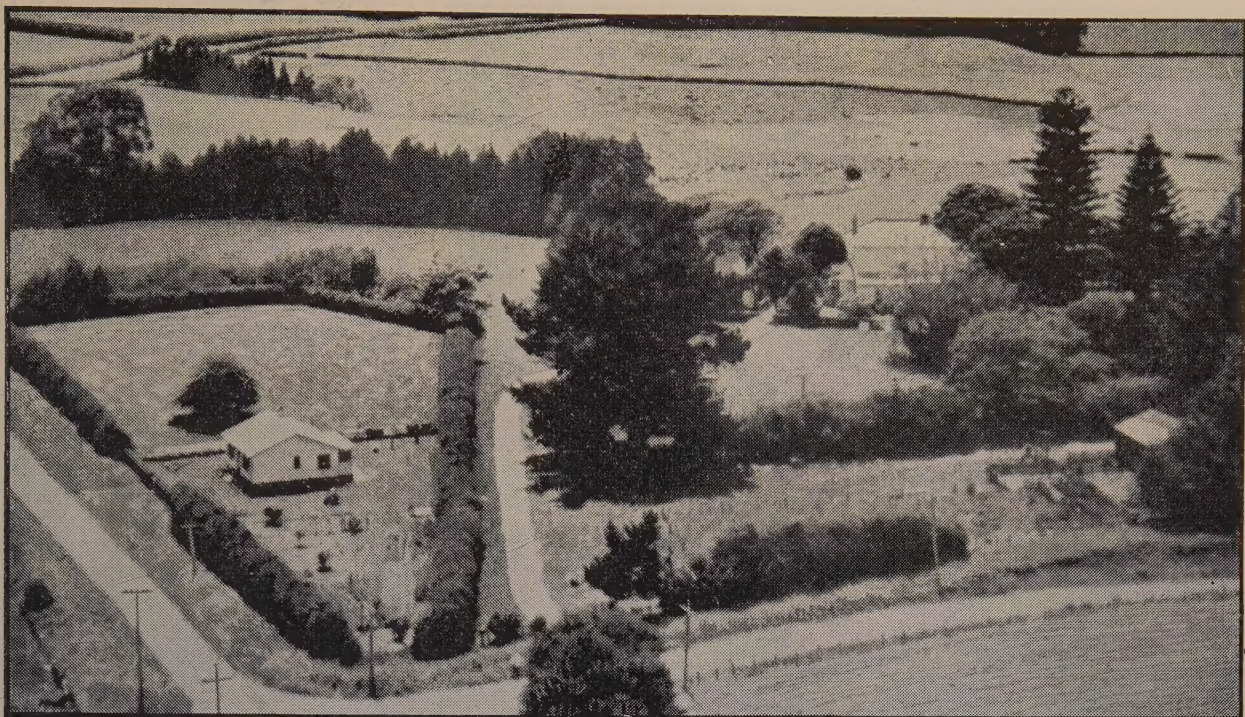
Improvement of Rolling, Wet Land

Improvement of Peat Land

Ideal Pasture

Upper—Not all wet land is flat. The easy paddock shown is part of the "oozing hills of Tauhei" at Mangateparu. The soil is white clay flecked with rusty granules; it is very soft in winter and hard and rough in summer. Soil and topography are both suitable for mole drainage. Middle—All farms in the Gordonton group of the Waikato dairy farm improvement scheme contain some peat land. The farm shown was originally all peat, but after 40 years is almost down to a soil bottom, with low islands of leached Hamilton clay loam protruding above flats of peaty silt loam. All paddocks are being resown after summer and winter crops, with manurial treatment based on soil analysis and plot trials. No silage is made. The cows shown yielded 200lb. of butterfat per acre in the 1952-53 season. There are excellent shelter belts. Lower—Twenty days' growth of silage aftermath; short-rotation ryegrass is prominent. The soil is Ohaupo silt loam, which has a very good texture but is not particularly fertile. The pasture is the result of the general aim of the scheme—soil analysis, resowing with certified strains, electric-fence grazing, and discontinuous harvesting—but not all farms have a combination of good soil texture and high-producing cows.





# Waikato Dairy Farm Improvement Scheme

## Results after 3 Years' Operations

THE Waikato dairy farm improvement scheme was inaugurated in 1950 as the result of action by the executive of Federated Farmers and was the forerunner of several similar schemes now operating in various districts of New Zealand. It consists of 3 groups of farms intensively supervised by the local Department of Agriculture Instructors, but financed by the individual owners. The aim of the scheme is to see how far production can be raised by applying the methods of the agricultural research stations on ordinary commercial farms before the economic law of diminishing net returns sets in, but not beyond a period of 5 years. The third year expired last June, and this article reviews the first 3 years' operations in terms of the advisory methods and production results.

ENOUGH financial details are disclosed to suggest that the application of more intensive farming practices has so far proved quite profitable. The article is by J. M. Miller, Agricultural Economist, Department of Agriculture, Hamilton, in collaboration with G. A. Blake, R. B. Gordon, and J. R. Murray, Department of Agriculture Instructors in Agriculture at Matamata, Te Awamutu, and Hamilton respectively.

If the average butterfat production for each farm for the two seasons 1948-49 and 1949-50 (the autumn of 1950 was rather dry) is taken as a basic figure for comparison, it is reckoned that the 11 farms remaining in the Waikato dairy farm improvement scheme for 3 years have been improved by 28.6 per cent., equivalent to 56,285lb. of butterfat on factory figures, and about one-third better than the district aggregate. Butterfat production in the New Zealand Dairy Board's Auckland (South) district on the same basis was improved by 20.6 per cent. or 32,000,000lb., the main factors being summer rainfall, potash

topdressing, the buckrake, and the electric fence, which lead to higher feeding standards and more cows; but the Crown's land settlement policy also contributed, and so the district increase is not altogether comparable with the increase on any special group of farms.

Though it is plain that dairy farmers in general in the Waikato are turning the new farm management techniques to good account, it is held that the results so far of the dairy farm improvement scheme are sufficiently different from the aggregate to merit an interim review. Assuming that there is such a person as an "average farmer", the farmers in the improvement scheme are average farmers in all respects except one, namely, that they are volunteer members of an improvement scheme which has intruded on their privacy and has yielded more butterfat, or rather more butterfat in a shorter time, than most of them otherwise might have had reason to expect.

None of the 13 original members has voluntarily withdrawn from the

scheme, but 3 of the farms have changed hands, and only 1 of the new occupiers has been eligible to join up. In the third season, therefore, there were 11 members. In the fourth season there will be 10, as another farm has been sold.

## History of Scheme

The scheme was formulated by Mr. A. G. Alexander, a Dairy Board member, in 1949, while he was still Dominion chairman of the dairy section of Federated Farmers. The Waikato executive of Federated Farmers approved of it and transmitted it to the Department of Agriculture early in 1950. The Department was unable to accept the proposal as it stood, but in March 1950 the Director of the Extension Division and the Rural Economist went to Hamilton and conferred with the provincial executive, the local Instructors in Agriculture, the Auckland Fields Superintendent, and the heads of the Rukuhia Soil Research Station in order to alter the proposal so that it would not entail any extra charge on the Department's annual estimates.

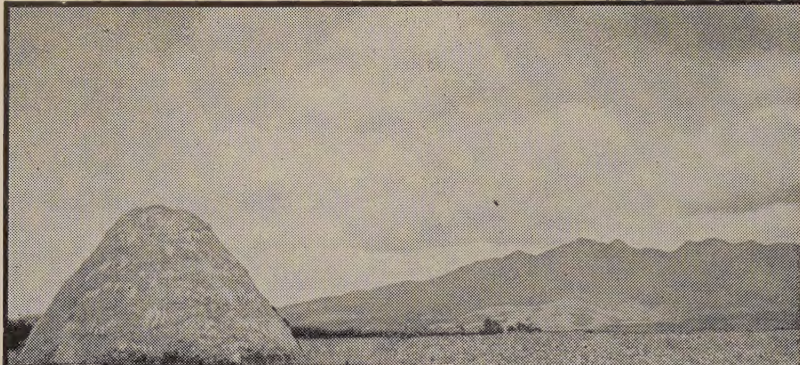
Federated Farmers had in mind the appointment of a special Instructor who would act as overseer for 40 or

**HEADING PHOTOGRAPH:** The 2-house farm. Under intensive management most Waikato dairy farms need two families to run them. The farm shown is of 116 acres and is in the Paterangi group. The old homestead is on the right and a new cottage on the left. Five farms in the scheme have 2 houses. Auster Airviews photo.

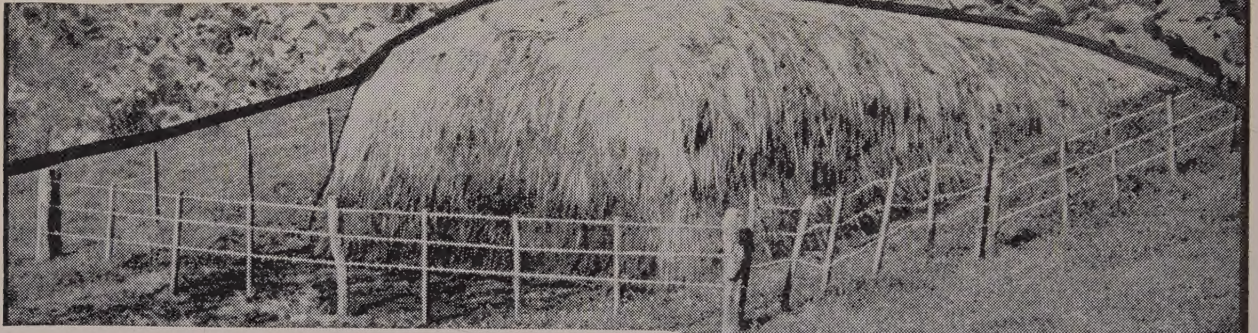


## SUPPLEMENTARY FEED

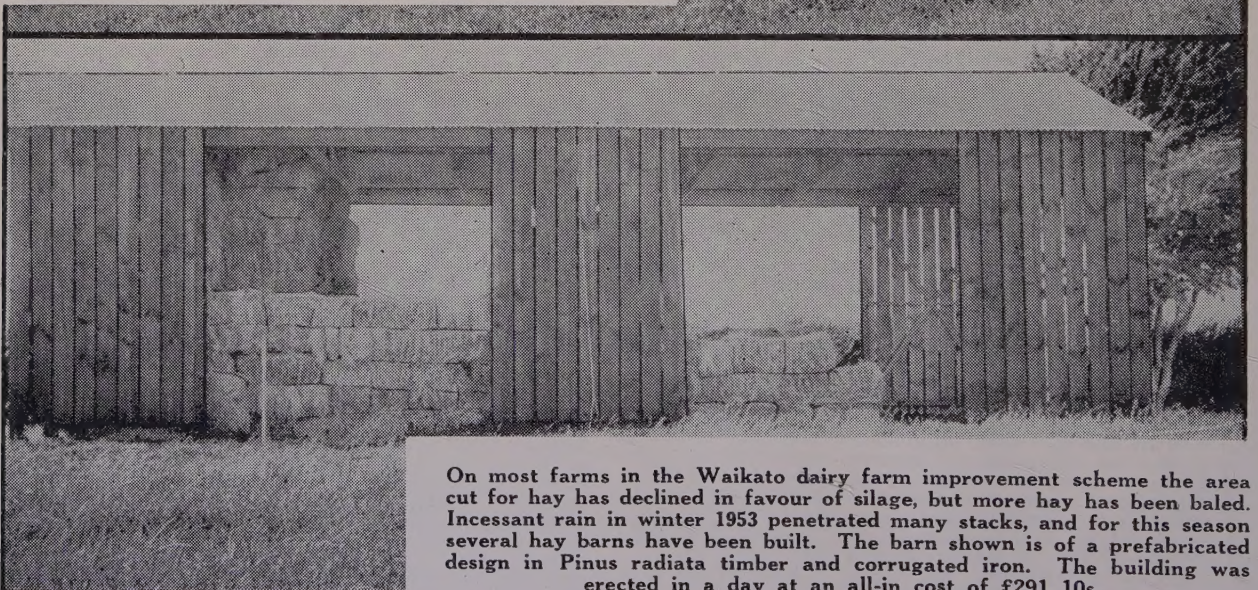
Dairy farming has been vastly changed within the last 5 years by almost universal adoption of tractor power, electric fencing, pick-up hay baling, and buckrake ensiling. Herds are better fed and more cows are carried. The Waikato improvement scheme's intensive programme raised annual production about 29 per cent. in 3 seasons, but in the whole of the Dairy Board's South Auckland district annual production increased by approximately 21 per cent. in the same period.



A summer crop. Nutritional tests at Ruakura Animal Research Station have confirmed that turnips are the best milk-producing supplementary summer feed, but many farmers have adopted the alternative of spray irrigation of pastures. The two systems may ultimately merge into irrigation of a turnip crop. The crop of chou moellier and turnips shown, which was photographed on 16 December 1953, was not irrigated. The haystack is surplus from the previous summer.



Buckrake wedge silage clamp. It is not as efficient as the pit, but often handier. A clamp should have a domed top to shed water and be at least twice as wide as the tractor so that it can be consolidated properly.



On most farms in the Waikato dairy farm improvement scheme the area cut for hay has declined in favour of silage, but more hay has been baled. Incessant rain in winter 1953 penetrated many stacks, and for this season several hay barns have been built. The barn shown is of a prefabricated design in *Pinus radiata* timber and corrugated iron. The building was erected in a day at an all-in cost of £291 10s.



50 farms and more or less control the work of each farm, imparting to the owners the latest methods of pasture management and utilisation, with the assistance, when needed, of specialist officers from the research stations and other Departments. The Instructor would also have to keep a system of farm records and accounts so that the cash value of his advice could be calculated. The source of the idea was Mr. Alexander's own activity as a farmer and as a consultant of departmental information; he wanted to know whether, if farmers followed all of an Instructor's recommendations, they could increase their production profitably. And altogether there seemed to be good reasons to believe, from the work of the Dairy Board, the research stations, and the surveys of Dr. W. M. Hamilton of the Department of Scientific and Industrial Research, that there was a large potential production increase on existing farms and among existing herds, and that it could be readily released through more efficient pasture management and utilisation.

If the pilot scheme were successful, the farms in the group would then become a demonstration district where field days would be held and visiting farmers would be able to get some idea of the increased production resulting and the costs incurred. No financial assistance, except in the supervision, was asked for.

### Selection of Farms

The Director-General of Agriculture being unable to agree to the appointment of a special Instructor, the Hamilton meeting had to modify the proposal so that the three Instructors at Hamilton, Te Awamutu, and Marama could share the supervision, with the Field Economist at Hamilton to keep the records. It was decided that the selection of candidates should be left to the Instructors, with the help of a small reference committee in each district. The districts selected by Federated Farmers were Mr. Alexander's district, Mangateparu, near Morrinsville; Gordonton, near Hamilton, and already celebrated for its farm labour scheme; and Paterangi, an old-established district on a very good soil type near Te Awamutu. Six volunteers from each district were called for by a small reference committee. Out of each 6 the Instructor selected 4, except in Paterangi, where 5 volunteered and were all accepted—13 all told. It transpired later that the Instructors found the selection awkward and would rather not have had the responsibility, as the applicants were all equally keen.

At the same meeting the organisers arranged a basic survey of a pre-selected farm to draw up a system of supervision for all. The owner had prepared a farm plan for the occasion. The field men—Federated Farmers officials, Superintendents, and Instructors—made a farm inspection, examining the pastures, shelter, drainage, subdivision, and access and discussing the history of each paddock, while Soil Chemists took field-by-field soil samples, and the Economists examined the accounts and records. The facts were all put together afterward in a "first report", from which a 5-year development plan and a detailed first-year programme, properly budgeted, were drawn up. Copies were sent to all

concerned with that farm, and the local Instructors and the Economist repeated the procedure for the other 12. The scheme began operating as from 1 July 1950 to run as a pilot scheme for 5 years, when the Department would reconsider the provision of an Instructor to be wholly occupied on that sort of work.

It got a good deal of newspaper publicity from time to time, and for that reason, and also because of similar farm advisory services being conducted by Instructors and Economists on mixed-cropping farms in Canterbury, it instigated requests for the selection of other dairy farm improvement groups in Wairarapa, Manawatu, and Taranaki. At present about 41 farms are participating in schemes under the Department's supervision. Instructors are, of course, still restricted in the number of farms they can take on because of other duties, and consequently one group of 50 farmers in Franklin County, near Auckland, have unexpectedly carried the scheme a stage further by appointing their own advisory officer at a salary subscribed by themselves.

The original Waikato scheme has proved easier to administer than was expected. Formal annual budgeting has been unnecessary and even intrinsically unreliable because of currency depreciation; and because of the good seasons some of the production targets have already been reached. Nevertheless, some unforeseen problems, to be described later, have cropped up.

### Objects of Scheme

The objects of the scheme were to increase butterfat production economically through pasture management and improvement (such improvement to include such capital work as the Instructor specified within the limits of the owner's resources) and incidentally to assess the value of the Department's advice. All agreements between parties, except that dealing with confidential information, were verbal only, and no participant was obliged to remain in the scheme any longer than he wished.

The Superintendent and the Senior Chemist of the Rukuhia Soil Research Station had offered to have the soil of every paddock sampled and analysed every year for phosphate and potash levels and lime requirement so that over the period the relation between soil analysis and topdressing and grazing management could be followed to the advantage both of the Research Station and of the participants. The offer was accepted by general agreement and the practice became the annual opening ceremony of the seasonal routine.

The Instructors were generally agreed that their primary objective was the complete utilisation of the grasses and clovers at the correct stage and the harvesting of all surplus feed, plus the provision of sufficient autumn-saved pasture for early spring feed.

Until that was done, and the herd response noted, direct herd improvement could be neglected. But since it is known from experience that pasture improvement is inseparable from

stock-carrying capacity, it was stipulated that herds should be tested and the herd increase anticipated as far as possible. Also, though not in the first season, it was arranged that the milking machines should be tested.

Though the primary objective can be so simply stated, in practice it was much more complicated, and in the first season only 3 herds, consisting of very responsive cows, gave notable responses—one of 22 per cent. and two of 14 per cent. The 22 per cent. increase was unexpected, as some of the paddocks on that farm had got very "foggy" and were trampled into mud in the first winter of the scheme; of the two 14 per cent. increases, one was due partly to the mole drainage of 4 paddocks in the previous season. It is likely that on all three farms a potash deficiency has been remedied.

Instructors at no time regarded the primary objective as being as simple as it was stated. For some farms 2 or 3 years of preliminary work were forecast in the improvement programme to make efficient pasture management even feasible; for example, the subdivision or resubdivision of paddocks, the provision or alteration of the central race, the drainage of wet land, and the renovation or replacement of old or poor pasture. At the same time the programmes planned the best use of the pastures as they existed from year to year, through the soil analysis and manurial recommendations, the electric fence, shutting up, harvesting, feeding off, and feeding out.

### First Season

At the start of the scheme several of the farms had no electric fence, 3 had no tractor, and none had a buckrake. According to the programmes, up to about 40 per cent. of a farm's area was eventually to be harvested for hay and for silage, and up to about 50 per cent. was to be shut up in autumn and break-fed in spring. At the end of the first season all had electric fences, all but one had a tractor, most of the owners had had a strenuous harvesting season with their own bigger crops and the usual commitments with their neighbours, and more than half of them had made up their minds to test a buckrake. That season the total butterfat increase was 8 per cent. over the previous 2-year average.

### Second Season

In the second season it was possible to initiate the corollary objective—that of increasing cow numbers. Most farms managed to do so, and this time the biggest production increases occurred on the farms that increased their cow numbers most. On 2 farms production went up 26 per cent. over 1950-51, and 3 others made gains of 10 per cent., 11 per cent., and 15 per cent. respectively. The second season ended with a total butterfat increase of 18 per cent. over the basic 2-year average.

### Third Season

In the third season both factors—more cows and more feed—continued to operate. Five farms made gains of over 10 per cent. on 1951-52—2 at 13 per cent. and 1 each at 15, 16, and 18 per cent. Out of the 11 farms remaining in the scheme at the end of the third season only 1 had gained less





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than 20 per cent. on the basic 2-year average, and the total production from all farms was 28.6 per cent. higher. One farm had gained more than 50 per cent. and 2 had gained 40 per cent.

At that stage—which at the time of writing is the present stage—7 of the members had turned to artificial breeding of replacement stock, and so the primary objective of the scheme has been expanded. On 2 of the farms the lack of a second house is a limiting factor (5 of the farms have 2 houses). These and other problems will be discussed later.

## The Method Exemplified

In the beginning it was intended that a general development target should be set up for each farm and attained in stages according to a monthly schedule of work prepared by the Instructor each year for the season ahead, but in practice there were too many unforeseen contingencies for the programmes to be carried out strictly as planned. At present, though the Instructor and the farmer both know what they are aiming at, it is left to the Instructor's discretion either to write out an annual programme or to advise the farmer from month to month in the course of his regular visits.

There is a plan of the farm, with the paddocks numbered, so that discussions by telephone or letter are mutually comprehensible. For one particular farm taken as an example there have been prepared in historical succession (1) the soil report, with reference to paddock numbers, or to parts of a paddock if the soil varies; (2) a description of the pastures, by paddocks; (3) the development targets; and (4) the first year's programme.

### 1. Soil Report

The soil report reads (in part): "In sampling the area we were not able to identify the various soil types encountered with any confidence. In certain fields, for example, 19, the soil proved particularly variable. Most fields displayed the rusty mottled appearance associated with periodic waterlogging. A deep gully cuts through fields 14, 15, and 16. The soil on the flats flanking the creek in the gully bottom was grey-black to almost 2ft. with rusty patches throughout. This was sampled separately in fields 15 and 16... [and] at the bottom part of field 7. A special sample was collected from the steep slopes in field 15. Apart from these instances, all fields were sampled as single units.

"**pH and calcium:** The soils in general are not particularly acid and are well provided with calcium. Areas which would be expected to respond to liming are fields 1, 2, the bottom strip in field 7, field 12, and fields 15 and 16 except possibly on the low flats; 10cwt. of well-crushed lime should be sufficient, but 1 ton might just as well be applied to cover maintenance for a few years. Fields 8, 10, and 11 are particularly well supplied. The remaining fields would need maintenance dressings, within, say, the next 2 years.

"**Potash:** Most of the farm is well provided, but responses would be

expected in fields 19 and 20, which are low.

"**Phosphate:** The soils do not 'fix' phosphate to any marked extent. . . . Visible responses to phosphatic applications would be expected in fields 1 and 16, and possibly in fields 7 (bottom flat), 12, and 15 (top flats) . . ."

Then follows a tabular list of all the fields and their analyses.

### 2. Description

The description of pastures is also a tabulation of the fields from 1 to 20, with a short list of the dominant species in each and usually a comment; for example: "1. Italian and H1 ryegrass, red and white clover . . . Good. 2. Ryegrass, paspalum, white clover, flat weeds . . . Fair. 3. Yorkshire fog, paspalum, little clover . . . Plough up. 4. Second-year grass . . . Sown species, good sward. 5. Third-year grass . . . Ditto. 6. Third-year grass . . . Extra good. 7. Ryegrass, white clover, cocksfoot, timothy, and



A first step in farm improvement is the adoption of the central race system—a wide grass lane or lanes leading from the cowshed to the extremities of the farm and giving direct access to each paddock. The central race is essential for intensive pasture management and acceleration of the "fertility cycle", but is sometimes difficult to plan on broken country or irregular holdings. The farm (Paterangi group) on which the race shown is situated is ideal, being easy country and rectangular. The race runs from the front gate to the back paddock. The bull paddock, with a double fence, is at left.

paspalum, Yorkshire fog . . . Open after wintering on", etc.

### 3. Development Targets

"This farm should carry 100 cows and rear all replacements. Production should reach 220lb. per acre or 33,000lb. under full development. The main developments required are: (a) Shelter on the southern and south-western boundaries and live hedges along almost all internal fences; (b) renovation of sodbound paspalum pastures; (c) drainage; and (d) further subdivision of the larger fields.

"After all pastures are renewed, attention may be given to irrigation from the stream on the farm to take the place of summer crops".

### 4. First Year's Programme

"Development programme, first year: (a) Begin rearing own replacements. This will require a new calf shed . . . fencing . . . concrete access race . . .

TABLE I—DEVELOPMENT TARGETS

|             | Cows in milk | Butterfat lb. | Butterfat per cow lb. | Butterfat per acre lb. | Breeding sows |
|-------------|--------------|---------------|-----------------------|------------------------|---------------|
| Base ..     | 100          | 26,500        | 265                   | 177                    | 12            |
| 1st year .. | 100          | 28,000        | 280                   | 187                    | 12            |
| 2nd year .. | 100          | 29,000        | 290                   | 193                    | 12            |
| 3rd year .. | 100          | 29,300        | 293                   | 195                    | 12            |
| 4th year .. | 100          | 29,700        | 297                   | 198                    | 12            |
| 5th year .. | 100          | 30,000        | 300                   | 200                    | 12            |



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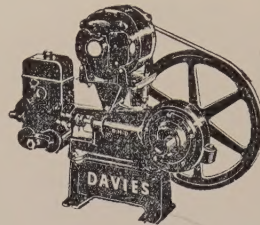
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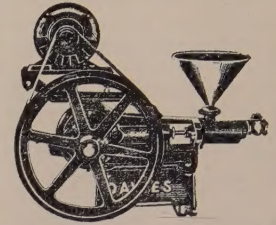
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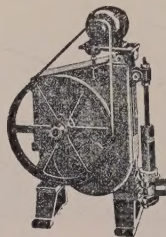


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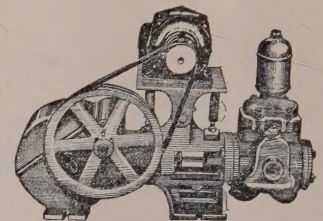
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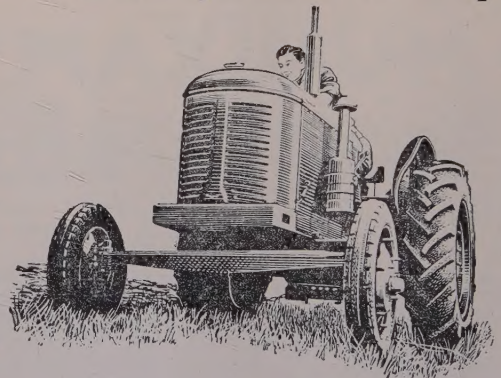
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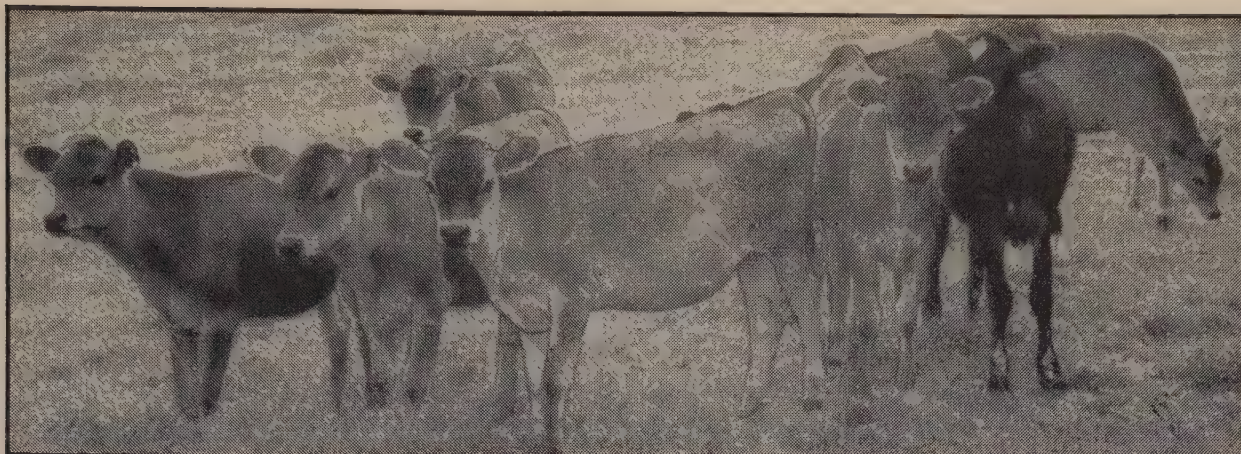
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Most farmers in the scheme rear their own replacement cows and shown here are a group of early-weaned calves on a farm at Paterangi. The Ruakura Animal Research Station technique of early weaning has caught on in recent seasons: Calves are fed whole-milk at the rate of 10 per cent. of their body-weight per day until they are 6 weeks old or 100lb. liveweight; then they are weaned on to fresh pasture ahead of the herd. To simplify procedure many farmers feed  $\frac{1}{2}$  gallon ( $5\frac{1}{2}$ lb.) of milk per feed and, to be on the safe side, wean at 8 weeks. A clean, warm calf house is desirable in the early stages. Seven farmers in the scheme have now made use of artificial breeding, some for 2 or 3 seasons.

gates . . . £115. (b) Plant *Cupressus benthami* and *Eucalyptus eugenioides* alternately at 10ft. spacings along southern and south-western boundaries . . . fencing 3 wires, 12 posts per chain . . . £120. (c) Drainage: spend £100 as required after observation next spring of results of recent mole drainage. (d) Extra maintenance: lime 65 acres at 10cwt. and potash 14 acres at 1cwt. . . . £90.

" . . . It is estimated that as a result of this programme butterfat production will be raised 1500lb., of which 400lb. will be used to rear 20 calves. It will still be necessary to buy replacement heifers this year. The farmer's net income should be up £180, and the value of his capital should be £500 greater. The farm income will be sufficient to maintain the farmer's cash balance at the bank, after allowing for the capital expenditure. . . ."

The programme then gives instructions about the tree planting and the construction of the calf house, and then goes into detailed suggestions for each month of the year, as follows:—

**"July:** As cows calve ration on the most forward field of autumn-saved pasture, using the electric fence, and feed as much hay as can be cleaned up with little waste on a neighbouring field which was not closed. After every field of autumn grass is fed off harrow well to spread droppings and close for next feeding. Save 20 heifer calves from the better cows. Disc and work up the best-drained portion of the old pig runs.

**"August:** After the pigs have eaten the carrot crop, plough for grass. After all the autumn feed is cleaned up the cows should be rotated round the farm on the best feed available, using the electric fence . . . throughout the spring and into the summer.

**"September:** Complete the working up of portion of the old pig run as soon as soil conditions permit, until

a fine bed is secured. Sow this small area with 8lb. of sugar beet in rows 1ft. apart at 1oz. to the chain, with serpentine superphosphate at 3cwt. per acre. Sow the carrot field with 15lb. of short-rotation ryegrass and 15lb. of Mother perennial ryegrass, 4lb. of broad red clover, and 2lb. of Mother white clover per acre with 3cwt. of superphosphate. Field 7, on which dry cows were fed hay, will be well pugged and should be rolled and sown with 10lb. of Mother perennial ryegrass per acre and closed for silage. Field 8 in a like state to be ploughed for soft turnips. Close field 19 for silage.

**"October:** As they can be spared from the rotation close up fields 15, 18, and 20 for hay. One of these may not be spared until next month. The most important point to consider is feed for the milking cows. Toward the end of the month, after thorough preparation with discs and harrows, field 8 to be sown half in Purple Top Mammoth soft turnips and half in Hardy Green Globe soft turnips at 1lb. per acre if broadcast, or 10oz. if drilled, with 3cwt. of serpentine superphosphate per acre. If soil conditions are suitable, disc and replough part of old pig run not planted in sugar beet. Keep the crop clean.

**"November:** Cut fields 7 and 19 for silage when ryegrass is in flower and, after harrowing, close for inclusion with the grazing fields in the rotation. Place silage from field 19 in field 16 for feeding next winter. Carry out mole drainage of wet patches revealed in the winter, using the McLeod system for effecting joins.

**"December:** Plant ploughed area of old pig run, after another ploughing, with sugar beet plants after soaking rain. If soil is fairly dry, tramp in plants after planting every second furrow. No further cultivation will be necessary. Fertilise face of furrows to be planted with 3cwt. of superphosphate. Cut fields ready for hay and, if soil is moist enough, harrow. Bale

and stack hay from field 20 in field 16 for feeding next winter, and the others in situ. Fence off from stock.

**"1951 January:** Feed Purple Top Mammoth turnips first, and then Green Globe, to cows in milk. Continue use of electric fence as long as good use can be made of it. Finish cutting and stacking hay.

**"February:** Finish feeding soft turnips, and, if weather dry, feed silage from field 7. Plough field 8 for Italian ryegrass. Disc to fine surface. If field 16 can be spared, shut it up for wintering dry stock.

**"March:** Harrow and roll field 8 until fine and firm and sow with 30lb. of Italian ryegrass with 3cwt. of superphosphate. Plough and disc field 19 for oats. Surface sow, after harrowing, fields lacking in white clover at 1lb. per acre. Begin topdressing the farm at rates set out. Shut up fields 15 and 16, if not already closed.

**"April:** Disc and harrow field 19 until fairly fine and sow 3 bushels of Algerian oats per acre with 3cwt. of serpentine superphosphate per acre. Finish topdressing and surface-sowing programme. Harrow and shut up in mid-April fields 10, 11, 5, and 2.

**"May:** Harrow and shut up fields 1, 17, and 8. Put dry cows in field 16 and then 15. Examine mole drain outlets regularly.

**"June:** Feed hay to dry cows in fields 15 and 16 when saved grass is finished. Feed store pigs on sugar beet."

This programme was not followed out entirely. The trees were received and planted in cold, dry, windy weather, and many of them died. Because of shortage of cement the calf house was not erected until the end of the second season. But the butterfat production went up by over 3000lb. instead of the projected 1500lb. In the third season, when 21 calves were reared, 109 cows were milked, and the fifth year target of 200lb. of butterfat per acre was reached with the factory figures.





Even on good soils cutting winds retard pastures. The southerly slope shown is admirably protected by cross hedges of leniently trimmed barberry.

### Group Results Compared

In Table 2 the average results of the farm groups are set out for comparison over the 3 seasons 1950-51 to 1952-53. Comparison of one group with another is hardly justifiable, because the differences between groups are due mainly to factors outside the scheme. The groups are 15 to 30 miles apart, and in districts with differing soils, summer climates, and periods of settlement and development. Paterangi has a general advantage over the other two in these respects.

The table deals with the 11 farms that have stayed in the scheme for 3 years, except that one of the Gordonton farms after changing hands was out of the scheme for about 6 months, so that its financial details for that season were not recorded. In the averages that fact is allowed for and is denoted by an asterisk. Another Gordonton farm unfortunately was sold at the end of the third season, but the records are not affected except in the percentage of autumn-saved pasture; in effect the whole farm was shut up by the middle of June, but only half the amount is admitted and the group average bracketed. In the Mangateparu group the change in acreage denotes the enlargement of one small

farm by the purchase of a next-door one; the two are now worked as one. The drop in the cow average at Mangateparu in the second season indicates a big influx of heifers into the herds.

The salient facts are: The increased carrying capacity, the increased herd averages, the consequently increased production per acre, and the increased surplus of revenue over running cost. Accompanying and explaining the change in productivity are the changes in feeding standards—less hay, more silage; less crops, more autumn-saved pasture—and in topdressing, where lime and potash deficiencies have been picked up and remedied, but not at the expense of phosphate. Incidentally, the decrease in total crop acreage has not affected summer cropping—mainly soft turnips but also maize.

The table gives no indication of what is assumed to have been an important factor in increasing production, namely, good seasons. In the last relatively dry summer, in the 1949-50 season, butterfat production after Christmas was 37.7 per cent. of the season's total, whereas in the 1952-53 season it was 39.1 per cent., a difference of only 1.4. It is beyond question that recent summers could with

advantage have been wetter, and therefore summer supplementary feeding has been by no means unnecessary. Two farms with very high standards of herd management got in the 1952-53 season 41.4 per cent. and 40.1 per cent. respectively of their total production after Christmas, the one from summer crops alone and the other from silage plus crop. The inference is that with herds that calve in July a "good season" is primarily one with a good spring and early summer.

### Financial Records

The farming operations are apparently no closer to the limit of profitable net returns than at the start of the scheme. Only in the Mangateparu group have the running expenses remained in the same proportion with the farm revenue, but that is probably connected with, if not wholly because of, the practice of buying instead of breeding replacement stock. The increasing farm revenue has, of course, resulted from not only higher productivity but higher payouts and, in the Paterangi group, the disbursement of an accumulated milk-powder fund. The "gross surplus" is a figure that is valid for comparisons only; out of it come interest on mortgages, overdrafts, and equities, depreciation of

TABLE 2—STATISTICAL COMPARISONS FOR 3 SEASONS OF AVERAGE RESULTS OF FARM GROUPS

|                                                 | Mangateparu group<br>(4 farms) |         |         | Gordonton group<br>(2* or 3 farms) |         |         | Paterangi group<br>(4 farms) |         |         |
|-------------------------------------------------|--------------------------------|---------|---------|------------------------------------|---------|---------|------------------------------|---------|---------|
|                                                 | 1950-51                        | 1951-52 | 1952-53 | 1950-51                            | 1951-52 | 1952-53 | 1950-51                      | 1951-52 | 1952-53 |
| Total acreage .. ..                             | 475                            | 523     | 523     | 297                                | 297     | 297     | 420                          | 420     | 420     |
| Cows milked per 100 acres ..                    | 63                             | 70      | 73      | 53                                 | 247*    | 66      | 68                           | 69      | 71      |
| Herd averages per cow (lb.) ..                  | 284                            | 274     | 286     | 274                                | 278     | 294     | 293                          | 303     | 310     |
| Factory butterfat per acre (lb.)                | 173                            | 187     | 204     | 138                                | 161     | 187     | 191                          | 205     | 215     |
| Percentage of acreage:                          |                                |         |         |                                    |         |         |                              |         |         |
| Cut for hay .. ..                               | 12.2                           | 19.5    | 9.8     | 11.5                               | 13.8    | 13.1    | 15.2                         | 18.8    | 8.6     |
| Cut for silage .. ..                            | 18.7                           | 27.3    | 22.8    | 4.4                                | 9.4     | 9.6     | 15.7                         | 18.0    | 22.9    |
| In crops fed off .. ..                          | 7.4                            | 5.3     | 5.8     | 10.5                               | 11.3    | 9.6     | 3.3                          | 2.3     | 1.9     |
| Shut up for spring (autumn-saved pasture) .. .. | 22.8                           | 41.3    | 37.8    | 18.5                               | 33.6    | (35.0)  | 27.9                         | 27.4    | 38.6    |
| Fertiliser per acre over-all:                   |                                |         |         |                                    |         |         |                              |         |         |
| Lime (cwt.) .. ..                               | 5.3                            | 3.1     | 1.8     | 5.2                                | 9.3     | 3.6     | 3.8                          | 2.6     | 1.1     |
| Phosphatic (cwt.) .. ..                         | 2.6                            | 2.9     | 3.3     | 2.5                                | 3.1     | 2.8     | 2.8                          | 3.0     | 3.7     |
| Potassic (lb.) .. ..                            | 3                              | 17      | 12      | 43                                 | 42      | 69      | 38                           | 42      | 45      |
| Nitrogenous (lb.) .. ..                         | —                              | —       | 4       | —                                  | —       | 7       | —                            | —       | —       |
| Farm revenue per acre (£) ..                    | 26.9                           | 31.5    | 37.2    | 22.8                               | 26.1*   | 35.0    | 32.0                         | 38.8    | 43.6    |
| Running expenses per acre (£) ..                | 13.1                           | 15.5    | 18.9    | 11.4                               | 13.3*   | 15.7    | 14.7                         | 15.2    | 15.4    |
| Gross surplus per acre (£) ..                   | 13.8                           | 16.0    | 18.3    | 11.4                               | 12.8    | 19.3    | 17.3                         | 23.6    | 28.2    |

\* One farm was out of the scheme for about 6 months (see text above).



assets, dairy company share purchases, some capital improvements and additions, and income and social security taxes. The remainder, net profit, is outside the scope of this group analysis.

## Interim Conclusions

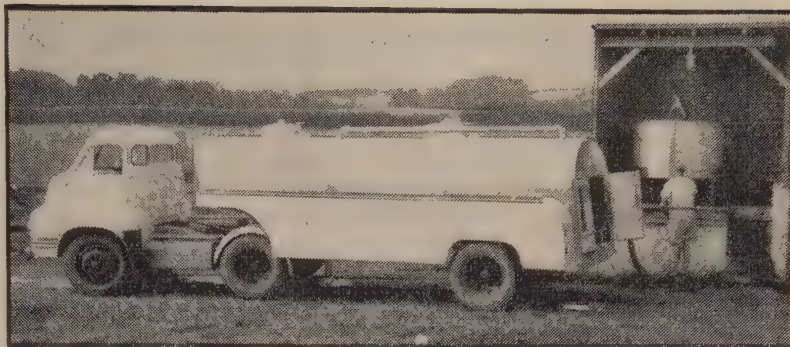
The general conclusion, as one member of the scheme has remarked, is that the scheme has been most influential and successful in so far as it has encouraged its members to do what they had in mind to do, but sooner. One might add that it has been least successful where it has failed to encourage its members to do what they did not have in mind to do. In between these extreme statements is a borderland where special technical information and animal husbandry experience have been exchanged.

From the Instructors' point of view, as expressed from time to time at conferences, the scheme has been worth while, as it has shown that the advice given to farmers in general extension work has been sound. Itemised, this conclusion has been enumerated as follows:—

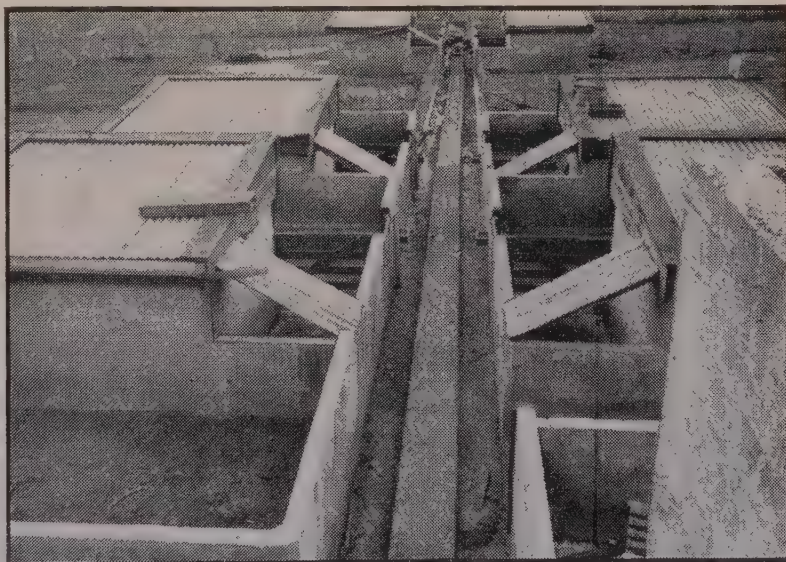
1. The provision of a central race or races, wherever practicable, is essential to good management.
2. The use of the electric fence increases the area that can be cut for hay or silage.
3. The use of potash, where needed, results in greatly improved pastures.
4. New grass after a crop provides more feed than old pasture.
5. Wintering on a poor paddock can greatly improve the sward.
6. The provision of sufficient autumn-saved pasture increases production the following spring and lessens the risk of bloat.
7. Summer cropping is justified.
8. Silage pits, with adequate drainage, result in less waste than stacks.
9. Subdivision and the alteration of fences are warranted where steep sidings and flat areas are in the one paddock.
10. The grading of steep banks gives a greater area of improved pasture.
11. Drainage is a necessary adjunct to pasture improvement and its proper utilisation.
12. Estimates of improvement are likely to be too conservative, as a plan of improvement usually includes many minor factors, such as the planting of shelter, the dehorning of calves, the elimination of mud, and the spraying of weeds, which are difficult to evaluate singly but which all add up.

In some cases the inherent conservatism of the estimate can unexpectedly lead up to another limiting factor, namely, the physical inability of a farmer to manage and milk more than a certain number of cows. Increased stock carrying is inseparable from pasture improvement. At that stage there are three openings:—

1. To redesign the milking shed; this is a promising innovation.
2. To run more dry stock; this is a sound practical choice.



Above—Whole-milk supply for manufacture of dried milk. Milk is pumped from the milk room to a stainless steel vat during milking. The tanker pump is connected with mains electricity and the vat is drained quickly. A farmer supplying milk for dried milk manufacture gets about 4d. per pound more for butterfat than does a farmer supplying cream. If he is on tanker supply, he must provide a suitably formed road to his shed from the public road and a milk stand to company specifications. The dairy company lends the stainless steel vat. All but three farms in the Waikato dairy farm improvement scheme supply whole-milk, but not all have tanker collection. Below—A well-built piggery such as that shown (at Mangateparu) may pay well, but only three farmers in the Waikato dairy farm improvement scheme keep pigs.



3. To build another house, employ permanent labour, and milk more cows; this is a socially desirable solution. At present in the Waikato the so-called "two-house farm" is the "desirable norm"; that is, from all points of view—the practical, social, and economic—it would be better if most farms were "two-house farms". Many are. Almost any dairy farm of 90 to 120 acres is capable of being farmed efficiently enough to support two families, and most lie within that range. When it comes to the point, however, the decision to build another house can be tantalisingly difficult, for many existing homesteads are old, small, or badly situated, and the temptation is to build a new homestead rather than a new cottage and to use the old homestead as the cottage—£5000 for a new homestead

against £2000 for a cottage, and none of it deductible from assessable income.

As only one of the farms has reached the level of 300lb. of butterfat per acre, it is to be hoped that the spirit of progress will prevail. A good sign is the interest being taken in the Dairy Board's artificial breeding service (formerly Ruakura's A.I. service). Seven of the members have now had cows artificially bred, 2 members for 3 seasons, 2 for 2 seasons, and 3 for 1 season. Of these 7, one has had to sell his farm and herd and is now out of the scheme and another has decided not to continue with A.B.

Undoubtedly the initiation of the trial of farm improvement groups has been well worth while.



# Making a Solar Wax Extractor

## Seasonal Notes for the Domestic Beekeeper

**A**FTER honey extracting is completed the equipment used for extracting the crop must be cleaned. Cappings also have to be disposed of, and in this article T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton, discusses a method by which cappings, pieces of comb, and old combs which have been rejected are rendered into beeswax by use of the solar wax extractor.

**B**EESWAX was a far more important product a century ago than it is today. Very few waxes or waxlike substances were known and beeswax was used in candles, which supplied most of the artificial light, in modelling and sculpturing, in the preparation of cosmetics, and for numerous other purposes. Many other waxes and waxlike substances are now produced from palm trees, desert plants, berries from the myrtle bush, and other plants, from the wool of sheep, and a few from minerals and from petroleum. There has therefore been a decline in the importance of beeswax. However, it is extensively used in the cosmetic industry for face creams, lotions, lipsticks, and rouges, in ointments, by the dental profession, and in furniture, floor, shoe, and leather polishes. Quantities are also used in electrical insulation.

The beekeeping industry itself requires a certain amount of beeswax for the production of comb foundation wax. When old and broken combs become unfit for use in the beehive they are melted and the wooden frames are filled with new sheets of foundation wax, which the bees draw out into new combs.

### Sources of Beeswax

Before the introduction of modern beekeeping methods more beeswax was produced than is the case today, as at the close of the season the bees of the colony were killed and all the honey and wax removed. With modern methods the bee combs are not destroyed and therefore less wax is secured.

The beekeeper has numerous sources of beeswax, but because of the work involved many beekeepers do not bother to produce it. It is a product of the apiary which should not be neglected. Beeswax is available from the cappings which are removed from combs in the course of honey extracting, pieces of broken comb, burr combs quite often built between supers, brace combs joining one comb to the next, natural comb built by the bees where the beekeeper has left the hive short of a frame, combs which contain too much drone comb, old combs which have become unfit for use in the hive, and various frame and hive scrapings.

Beekeepers should not throw pieces of wax or old combs into heaps or leave combs in hives which have died out, as in addition to the value of the wax itself such places can be excellent breeding grounds for wax moth. Such practices are breaches of the Apiaries

Act and Regulations, as under the Act wax moth, which can be very destructive, is proclaimed a disease.

### Rendering Comb into Beeswax

Beeswax is removed from combs, cappings, and the like by means of heat. Various methods are used, such as boiling the comb in water and skimming the wax off or breaking the comb up, heating it in a sack, and then pressing it with a wax press while it is hot. There are also water-jacketed containers which melt the wax, and in the March 1953 issue of the "Journal" the method of using the Dunstan wax melter was described.

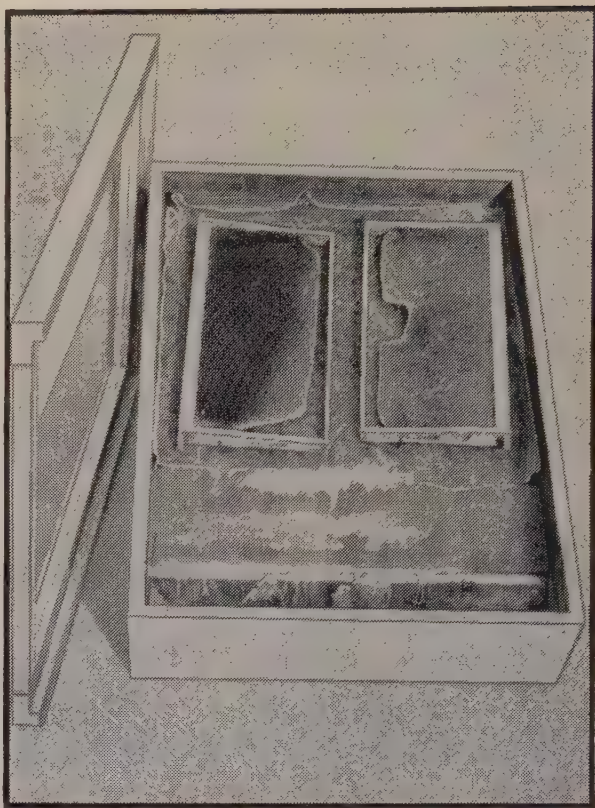
A useful and inexpensive device for extracting wax on a comparatively small scale is the solar wax extractor, which utilises the sun's heat to melt the wax. It consists of a box covered on top by glass. The woodwork should be substantial so that it will stand the heat and the box should be well constructed so that it will hold the heat. The box should be about 5ft. 3in. long and 2ft. 8in. wide. It is important that the depth does not exceed 4½in. A sheet of black iron is placed on the floor and is turned up at the sides. A sash is made and fitted with two sheets of glass with 1in. of air space between them. A single sheet of glass will work satisfactorily in very warm districts. At one end of the box there should be a trough about 8in. wide and 3in. deeper than the bottom of the box to catch the melted wax.

A piece of clean sacking is placed on the iron and the comb is laid out on the sacking. The extractor should be tilted at an angle of about 30 degrees by resting one end on a box or bricks and should be placed in a well sheltered but sunny position facing north so that it will receive maximum sunshine.

The wax melts and runs down into the trough at the bottom, and the propolis and other rubbish, commonly called "slumgum", will be left behind on the sacking.

### Refining Beeswax

Pure beeswax should be yellowish brown. If it is dark brown it may be contaminated with propolis and/or



*[Morgan's]*  
A home-made solar wax extractor. The glass top has been removed and can be seen on the left.

iron stains or it may contain impurities and will have to be refined. The wax should be placed in a 4-gallon tin containing about 2 pints of water. The tin is stood in a copper of water until all the wax has melted and is nearly boiling. The lighter impurities will float to the top and are skimmed off. The fire under the copper should be put out and the wax allowed to cool very slowly. If a few damp sacks are thrown over the top of the copper, this will help to keep the warmth a little longer.

About 24 hours later it will probably be found that the wax has set, and it should then be tipped out of the tin. The impurities should then be trimmed off the bottom of the cake of wax and thrown back into the solar wax extractor.

Difficulty may be experienced in removing the cake of wax from the tin, but this can be overcome if before the wax is melted a piece of rope is tied around the middle of the tin and a wedge of wood is pushed between the rope and tin on each side so that the sides belly inwards. After the wax has melted and set and the cake is to be removed from the tin the wood wedges should be removed, allowing the tin to regain its original shape. The cake of wax will then come out easily.



# Water for Poultry

**POULTRY**, like human beings, can maintain life on water alone for a fairly long period, but the health of birds with food but no water will be affected within a few days. This article by H. H. Watson, Poultry Instructor, Department of Agriculture, Wellington, draws attention to the importance of providing adequate clean, cool water at all times and describes the best methods of supplying it to birds of different ages.

**THE** water content of a newly laid egg is approximately 66 per cent., of a chick at hatching time 79 per cent., and of an adult bird 56 per cent. Water is one of the six nutrients required in the make-up and maintenance of a bird and its uses are as follows:—

It is an important constituent of blood and lymph, as it carries digested food to all parts of the body and waste products to the point of elimination.

It moistens and hydrolises the food during digestion.

As a bird has no pores in its skin, the intake of water controls body temperature through absorbing the heat of cell reactions and by vaporising moisture for excretion by way of the air sacs and lungs. It also serves as a lubricant of joints, muscles, and other body tissues.

## Requirements

The daily requirements of drinking water for chicks, growing stock, and adult stock vary according to climate. Young chicks should be provided with approximately  $\frac{1}{2}$  in. space each at water fountains and the space should be increased as the chicks grow. At



A piped water supply to troughs is the best method of providing water to poultry on free range. In this trough outside a colony house a constant supply is maintained through the use of a ball-cock.

maturity 100 birds will consume up to 5 to 6 gallons of water daily. Sufficient containers should be provided to hold an adequate amount of fresh water at all times, as insufficient space at water containers and lack of water can lead to stunting or slow growth of young birds and to a decrease in egg production of layers.

Chicks when placed under a brooder or a broody hen require water before food. The most suitable containers are normally those of a fountain type and these can be purchased from egg floors or hardware stores. There are different sizes for chicks of various ages.

Fountains should be placed on boards to keep litter from contaminating the water and also to assist in keeping conditions around the watering systems as dry as possible. Dryness around fountains and under the brooder is vital, as damp conditions are the first step toward trouble, because germs normally thrive under damp, humid conditions and the younger the bird the less is its resistance to disease.

From the time chicks are a month old shallow tin water containers can be used and a useful size is 2ft. 6in. long, 4in. wide, and 3in. deep. Each tin of this size will hold sufficient water for the daily needs of approximately 50 chicks. Other suitable containers can be made from used car tyres cut in halves to give two containers from each tyre. The main

point is water containers should not be too deep, because if chicks get into deep containers they are unable to get out. If fairly deep tins have to be used, 2in. wire netting can be placed over the top, thus allowing chicks to drink but not to get into containers. Alternatively, stones or bricks may be placed in containers to act as safety zones for chicks which may fall in. When the sides of tins are fairly high a step or bricks can be placed along the sides of the container thus allowing chicks to reach a convenient height to drink.

## Water for Colony Houses

If possible, poultry keepers should endeavour to transfer chicks when they reach the perching stage to colony houses on fresh ground, but the greatest problem on many farms is providing a constant supply of water to the new area. Piping of the supply is the best solution, but in most cases it is costly, so alternative measures have to be taken and one commonly used is the sledging of 44-gallon drums to suitable positions.

With this system some poultry keepers have a ball-cock fitted to the drum and this is over a shallow trough; others fit a tap and leave it dripping slowly. Both methods are very satisfactory and much better than carrying water in buckets, which not only is tedious but takes up a considerable time.

If there are other stock in the same paddock as growing chicks, it is advisable to protect both water and food containers and this can be done with hurdles, rails, or temporary fences.

## Water in Laying Quarters

Usually water containers in laying houses are in a suitable position and large enough to hold sufficient water and give ample space for birds, as many birds may require a drink at the one time.

Water containers can be placed either inside or outside the laying house, but the latter position is more satisfactory, because dampness is kept to a minimum. Containers should be at



The placing of a water container on the outside wall of a fowl house ensures that dampness from spilt water or flooding of the container is avoided inside the house. A cover should be fitted to keep the sun from warming the water and, in colder districts, to prevent the water freezing.





The nipple system of watering, by which birds obtain water by pressing their beaks against nipples fitted to a water pipe. To prevent dampness an overflow trough should be fitted below the nipples.

least 12in. above the level of litter in the shed and a step should be provided 9in. below the top of the container. It has been noticed that if the step for birds is less than this, birds tend to put their heads and wattles into the water, and when these are removed drips come from the wattles and create dampness around the trough area. On most commercial farms water is piped throughout the sheds and the flow of water is usually controlled by a ball-cock or tap. Though these systems require little attention, containers should not be allowed to become dirty. A good practice is to have outlets fitted to containers when they are being made so that when they are being cleaned dirty and contaminated water can be removed without the containers having to be shifted.

Water containers should be above floor level. If a bucket type is used, it should be set on bricks on a raised platform. Many producers prefer a container to each house instead of one to two houses, because if birds are affected with coryza or other infectious disease, spread of infection is less where houses have individual drinking facilities.

If water containers are within the fowl house, provision should be made to keep dampness to a minimum. A way of doing this is to have a rolled lip inside at the top of the container and a step approximately 9 to 10in. lower than the water level.

However, it is better to have water containers outside the house with openings through the wall where birds can reach out to get water. If a piece of flat iron is placed under the water container and sloped downward from the inside of the shed, any water that the bird drops can drain to the outside. With this system it is desirable to have a movable cover over the water container to prevent the sun from warming it or, in colder areas, to prevent the water from freezing during winter. Another advantage of outside troughs is that any flooding which may be caused through a leaking ball-cock occurs outside the house. This also applies with taps, because on many farms though taps are regulated to drip slowly, rate of flow is sometimes faster than intake by birds and flooding may occur.

Another method of supplying water to laying stock is by the nipple system. To operate this a reservoir is required at a higher level than the

pipe that runs throughout the shed. This pipe should be 21in. above the level of litter in the shed and nipples are placed at convenient distances apart, allowing one nipple to every 8 birds. Each nipple is spring loaded with a small ball bearing or plunger at the base and when a bird requires water it presses its beak against a nipple and allows water to drip into its gullet. Obstructions can cause trouble with this type of drinker. If particles of litter become lodged between or under the ball bearing or nipple, water will drip until the trouble is remedied. To guard against dampness with this water system it is advisable to have an overflow trough 3in. to 4in. below the nipples into which surplus water can be drained and so run outside the shed. Alternatively the nipple system could be placed outside the shed where the birds could reach it through an opening to obtain a drink. However it would not be advisable to have the system outside in districts where hard frosts are experienced.

### Main Recommendations

The main recommendations for supplying poultry with water are as follows:—

1. Sufficient containers for all stock from day-old stage to adult birds should be provided and the water kept fresh and cool.
2. Dampness around watering devices should be avoided, as damp conditions favour germs and are detrimental to the health and production of birds.
3. Automatic waterers can save hours of work and are recommended for commercial or semi-commercial farms.

### New Bulletin on Poultry Keeping

EGGS, like vegetables, are at their best when fresh. The knowledge required to keep fowls on a small scale is not great, but the essentials of management should be thoroughly understood and consistently applied. Failure to obtain satisfactory egg production from a household flock is often caused by lack of knowledge of the simple rules of management.

"Household Poultry Keeping", a bulletin just published by the Department of Agriculture, covers all aspects of poultry keeping for those with small flocks. The 64-page bulletin is well illustrated and contains an index. Copies of Bulletin No. 336, "Household Poultry Keeping", are available from main offices of the Department at 1s. per copy.

### Course for Poultry Producers

A 2-day instructional course for poultry producers will be held at Canterbury Agricultural College, Lincoln, on 11 and 12 May. A registration fee of 2s. 6d. per day is payable and hostel accommodation is available at the college for 17s. 6d. per day.

The course will consist of a series of lectures by officers of the Department of Agriculture, members of the staff of Canterbury Agricultural College, poultry farmers, and others.

Further information may be obtained from the Registrar, Canterbury Agricultural College, Lincoln, Private Bag, Christchurch.

## Wool Bales Must not be Overweight

THIS is generally the peak period of the wool shipping season and, to judge by the number of complaints of overweight bales being lodged, it is not inopportune to remind growers and others responsible for the preparation and dispatch of their product of their obligations in respect of the weight of bales.

These obligations are clearly set out in the Board of Trade (Wool Packing) Regulations 1948, Section 4 of which states:—

"The maximum weight for a bale of wool intended for sale or for transport (including both the weight of the woolpack and the weight of its contents) shall be:—

"(a) Where the bale contains wool of one or more of the following descriptions (whether with or without wool of any other description)—namely, slipe wool, lamb's wool,

carbonised wool, scoured wool, and wool in the fleece—400lb.

"(b) In any other case—450lb."

In both instances a tolerance of 2½ per cent. is allowed, but any infringement of the regulations beyond this limit will, under Amendment 1 (1949), render persons responsible liable to a fine not exceeding £5.

Additional expenses by way of time wasted in unstitching, emptying, and repacking overweight bales, extra storage charges, and the possible resultant loss of shipping-space allocations can, of course, make the effective penalty on the grower very much more severe than this. It is therefore in the interests of all concerned that growers ensure that bales of wool are carefully checked before leaving their properties to see that weights are correct.



# Dormancy and Some Other Problems in Seed Testing

Contributed by the Extension Division

THE work of the Department of Agriculture's Seed-testing Station, Palmerston North, includes the study of dormancy in seeds, "Hard seededness", occurrence of parasite seed, and seed moulds such as *Fusarium* spp. Research conducted at the Station aims at finding the most effective and practical means of overcoming these conditions. Germination tests are also carried out on a wide variety of seeds, and details are given in this article of tests with New Zealand spinach seed.

THE word dormancy is used in seed testing to indicate any condition which prevents the germination of viable seed when other conditions such as moisture and temperature are favourable.

Dormant seeds normally require a period varying from a few weeks to several months for internal changes in the seed to take place before germination can begin. Tree seeds are often dormant for several months, but in grass seeds such as chewings fescue and dogstail dormancy is usually short lived.

At the Seed-testing Station, Palmerston North, it is essential to find means of overcoming dormancy in freshly harvested seed so that the true germinating capacity of the samples submitted can be reported as soon as possible. In the laboratory the most satisfactory method of overcoming this dormancy in grasses and clovers is to pre-chill the germination test for 4 days at 5 degrees C. Other methods include drying the seed, treating it with a dilute solution of potassium nitrate, or lowering the germination temperatures.

## Dormancy in Grass Seeds

Post-harvest dormancy was apparent in many samples of freshly

harvested ryegrass tested last year. This dormancy, lasting under 2 months in perennial ryegrass and rather more prolonged in Italian and short-rotation ryegrasses, was overcome by pre-chilling the tests for 4 days at 5 degrees C. Investigational work indicates that light may be a factor in overcoming dormancy in short-rotation and Italian ryegrasses. In routine tests on crested dogstail and chewings fescue samples pre-chilling methods have proved successful in overcoming dormancy, which persists for 4 or 5 months in these seeds.

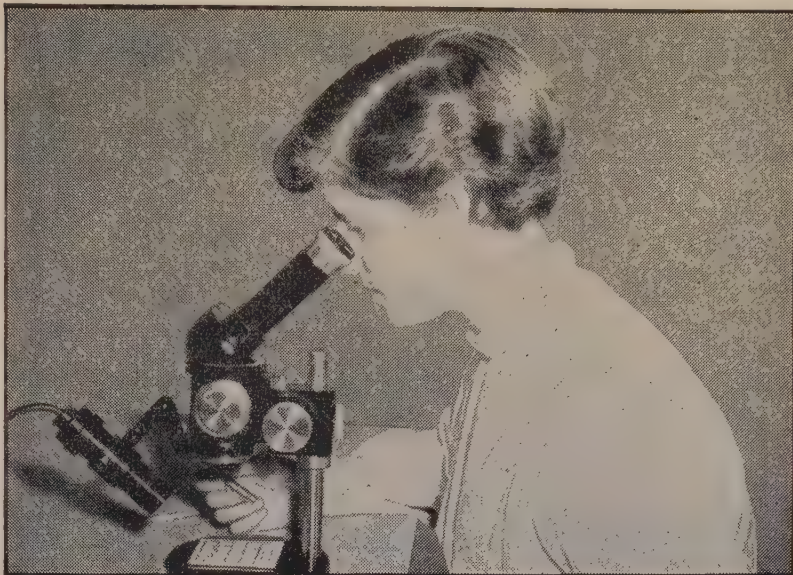
About 30 per cent. of the browntop samples tested have shown post-

harvest dormancy, which in many cases has been difficult to overcome, pre-chilling the tests being only partly successful. Overseas experience indicates that a low night temperature is necessary to overcome dormancy in browntop, and this method has been successful here in persuading viable seeds to sprout. Treatment of the paper used as a substratum with a dilute solution of potassium nitrate has also proved most helpful. However, times of testing have sometimes had to be extended up to 36 days. Dormancy has not been found in samples of Certified browntop seed. Of the samples showing dormancy in 1953 about 50 per cent. came from Christchurch and 30 per cent. from Ashburton seed firms.

## Dormancy in Cereals

Dormancy in cereals has been noted in New Zealand for many years and samples received early in 1953 gave an indication that many samples would probably show dormancy that year also. In reply to requests by the Station for samples of freshly harvested seed 71 samples of cereals from all parts of New Zealand were received in March 1953 for special investigations. These samples were subjected to germination tests at a range of temperatures and to various treatments for overcoming dormancy. At the conclusion of the tests all ungerminated seeds were examined to see whether they were dormant or dead.

As in previous years Cape barley, Algerian oats, and Dreadnought wheat showed more dormancy than other varieties, and neither pre-chilling nor germinating at low temperatures dispelled this. Dormancy in these samples was still evident 5 months later. There were signs of dormancy in Research barley, Dun, Abundance, and Achilles oats, and Tainui, Hilgendorf, and Yelder wheats, but this was of short duration.

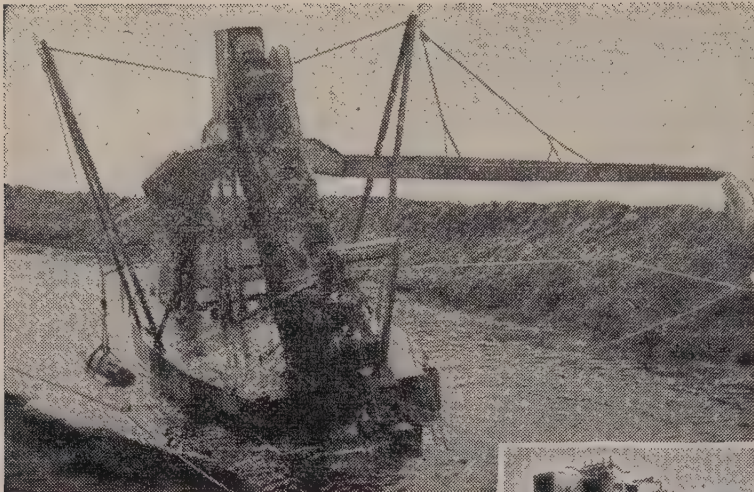


Pre-chilling in a refrigerator is one method of overcoming dormancy. There are transparent covers over the seeds.



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Kenia barley and Fife Tuscan, College Hunters, and Jumbuck wheats were not dormant. There was no evidence of dormancy in the 11 samples of Cross 7 wheat forwarded for the special investigations, but dormancy was apparent in a few of the routine laboratory samples.

#### Dormancy in Clovers

In clovers two forms of dormancy are found, the better known being described as hard seed and the second being described as "freshly swollen seed". Generally the percentage of hard seeds cannot be altered in laboratory testing without scarification, and the second condition is readily overcome, so that tests have not been carried out recently on dormancy in clovers.

Hard seeds, which occur naturally in different clovers in varying amounts, do not imbibe water when the seeds are subjected to the normal germination conditions. The cause of this is an impermeable layer in the seed coat. Under laboratory conditions of germination the seed may remain hard for years. This hard seededness in clovers is overcome by breaking or cracking the impermeable layer in the seed coat. Clover seeds collected from heads in the field and hand rubbed usually show a high percentage of hard seeds. When seed from the same crop is harvested mechanically the hard seed content is much less and is further reduced when the seed is machine dressed.

In the second type of clover dormancy the seeds take up water and swell, but may not germinate at normal temperatures and may remain at the end of a test as freshly swollen seed. This condition occurs for a short time early in the season and is noticed particularly in white, red, suckling, and subterranean clovers. However, it can be overcome readily by reducing the germination temperature slightly.

#### Effect of Mercurial Dusts on Cereal Germination

Because of unfavourable weather during the harvest of 1953 many cereal samples forwarded for germination testing that year showed a high percentage of seedlings with brown roots. The browning of these roots was due to infection by *Fusarium* spp. This mould can be easily controlled by dusting the seed with a mercurial fungicide.

Mercurial dusts should be applied carefully. A rate of 2oz. per bushel is recommended for controlling covered smut of wheat, oats, and barley and loose smut of oats. This treatment also checks *Fusarium* spp. efficiently. Several much over-dusted samples have been received and in laboratory tests these produce a high percentage of abnormal seedlings with thick, glassy shoots and short, stunted roots.

#### Germination Tests with New Zealand Spinach

Germination of New Zealand spinach has been investigated at the Station and various methods tried to overcome the dormancy which frequently exists. The fruit of New Zealand spinach consists of several small seeds enclosed in a hard, woody structure. Immediately surrounding the seeds is a pulpy



Pre-chilling (upper) overcomes dormancy and germination becomes normal. The seeds in the lower photograph have not been pre-chilled.

substance which appears to be partly the cause of delay in germination. The method in general use at this Station for testing the germination is as follows:—

The seed is placed on a fairly dry substratum and grown at 15 degrees C. for the first 3 days. It is then scarified and subjected to alternating temperatures of 18 and 20 degrees C. The test requires a period ranging from 28 days to about 72 days. This method does not give a complete germination and it has been found necessary to scrape away the pulp with a scalpel. This gives improved results, but it is not completely successful and other methods have been tried.

The methods showing higher germination are as follows:—

1. The seed was soaked overnight, cut through at the apex (thus exposing the individual seeds), and germinated on a fairly dry substratum at alternating temperatures of 5 and 30 degrees C. The length of the test was 31 days and the final germination was 60 per cent.
2. The seed was grown on vermiculite at alternating temperatures of 5 and 30 degrees C. After 12 days in the germinator the pulp was carefully scraped from the seed and the test continued. The length of the test was 29 days and the final germination was 56 per cent.
3. The seed was soaked in concentrated sulphuric acid for 5 minutes, well rinsed in running water, and then grown at 15 degrees C. The length of the test was 50 days and

the final germination was 52 per cent.

4. The seed was grown on soil at alternating temperatures of 5 and 25 degrees C. The soil was fairly dry. The length of the test was 35 days and the final germination was 70 per cent.

Further experiments will be carried out on other lines of New Zealand spinach.

#### Broom Rape in Clover Seed

Broom rape (*Orobancha minor*) is a parasitic plant which is sometimes found on the roots of clovers and other leguminous plants. It is an economically important weed in certain clover growing districts, chiefly in Nelson and Marlborough and to a less extent in Wairarapa and North Canterbury. There has been some indication that the parasite may be spread by clover seed, but the seed of broom rape is so tiny as to remain undetected during an ordinary purity test, since it appears as dust.

Some preliminary investigations have been made in which samples of clover seed were examined under a dissecting microscope. Broom rape seed was found in 3 out of 6 lines grown in broom rape areas and in 1 of 16 lines taken at random from ordinary laboratory samples. Thus there is some evidence that the parasite can be spread by clover seed, but further work will be needed to find to what extent this occurs.

Photographs by Embassy Studios.



# Aerial Topdressing in Poverty Bay

By H. de O. CHAMBERLAIN, Instructor  
in Agriculture, Department of Agriculture,  
Gisborne

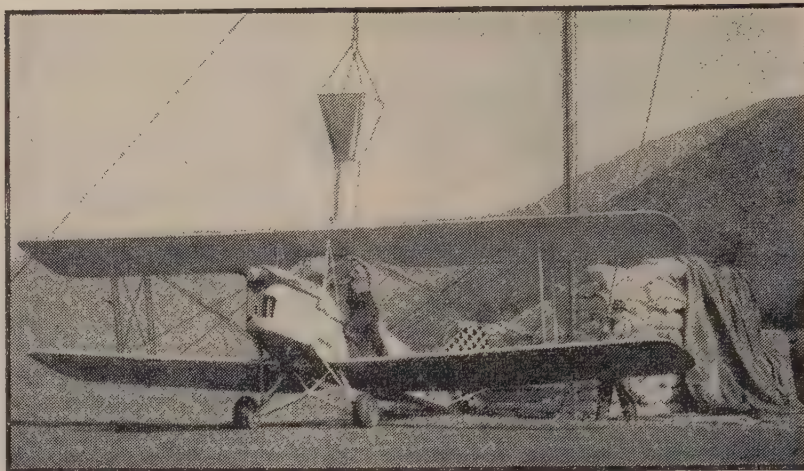
THE first aerial topdressing of hill country in Poverty Bay was done on the property of Mr. B. J. Holdsworth at Puha in August 1949 when a light aeroplane was used to demonstrate the possibilities of this method of applying fertiliser to hill country. Since this pioneer effort aerial topdressing has developed rapidly in this area. Three aerial topdressing companies, using 19 aeroplanes in all, are now operating over the 5 Poverty Bay counties of Matakaoa, Waiapu, Uawa, Cook, and Waikohu, where farmers have constructed, often at considerable expense, 120 flight strips with many more planned.

THIS year it is expected that about 22,000 tons of phosphatic fertiliser will be spread over approximately 200,000 acres in Poverty Bay, a considerable increase on the 5000 tons used in 1948 before aerial topdressing was begun.

The long and costly rail and sea freights from the distant fertiliser works at Wanganui and Auckland to the few points of distribution in the district, together with the long road distances from the rail and ports to the farms, make topdressing a costly proposition on this east coast country and special care is therefore necessary to see that the best possible results are obtained from topdressing. There are about 1½ million acres of grassland in the 5 counties, and with the exception of the best of the fertile Gisborne flats and some similar river flats in other places most of this grassland responds well to phosphatic fertiliser and some parts to lime. Upward of 1 million acres is hill country and of this it is estimated that at least 750,000 acres is in a condition to respond to topdressing provided that the essential clovers are in the sward or are put there to make use of the fertiliser.

## Need for Clovers

Trials over the past 15 years on Poverty Bay hill country with various fertilisers and the introduction of clovers by oversowing have shown that very good responses to both superphosphate and serpentine superphosphate can be expected provided white or subterranean clovers or *Lotus major* are there to use the phosphate. Farmers' experience has confirmed these results, yet observations of aerial topdressing operations on hill country in recent years have shown that large quantities of fertiliser have been applied at great expense to country devoid of clovers or where only poor and low producing annual clovers come in with the topdressing. That suitable clovers can be introduced by oversowing has also been demonstrated in trials and by many individual farmers, but the need for care in the choice of clovers to suit conditions and the need for special care in the time of sowing the clovers have also been well demonstrated. Without clovers topdressing is practically useless.



[K. R. Wade]  
Loading an aerial topdressing aircraft on the landing field on Mr. B. J. Holdsworth's property, Puha.

Subterranean clover does best on the drier, sunny faces and does particularly well on the coastal country. It should always be sown in autumn at 3lb. to 4lb. per acre after good rains. It pays to wait until there is no danger of the soil drying out again and killing young plants. For good establishment there should be some grass cover on the land to protect the seed from birds. The establishment is helped considerably by the area being spelled during flowering the following early summer.

Certified white clover at up to 2lb. per acre is recommended for seeding all shady faces and for the bulk of the better quality inland hill country. White clover establishes best when autumn sown on a closely grazed surface. Areas oversown should be spelled for a few weeks after seeding, which should be done as early as possible after good autumn rains.

For really high rainfall country (upward of 70in.) and for low fertility country with moderate rainfall, *Lotus major* at ½lb. to 1lb. per acre is strongly recommended as a pioneer clover. This plant is slow to establish, but it spreads freely and colonises the country well. *Lotus major* can be sown at almost any time of the year, but white and subterranean clovers should be sown in autumn only, irrespective of when the area is topdressed, except in cold inland districts subject to heavy frosts, when white clover can be sown in spring with good results.

## Stocking Topdressed Country

To get payable returns from topdressing and oversowing provision should be made by way of additional stock to make full use of the response to the fertilisers applied.

Far too much country has been topdressed without the stock being increased to use the grass. Only when the grass is put through animals and

back to the land as dung and urine can the results of the initial improvement from topdressing and seeding to clovers be obtained. It is the extra dung and urine which produce more and more feed that give the real improvement and payable results.

As a rough guide based on considerable experience in the development of topdressing on hill country the following procedure is recommended to avoid wasteful use of fertiliser. On country averaging 1 to 1½ ewes per acre up to a fifth of the farm should be oversown and topdressed the first year. The next year the topdressing should be repeated and at the same time the next fifth should be oversown and topdressed. In this second year the stocking of the first area should be increased by at least ½ ewe per acre topdressed. Each succeeding year a new area should be oversown and topdressed and at the same time the dressing should be repeated and the stocking increased as before on the last topdressed area.

It will take 6 years to complete the oversowing and double topdressing of the farm and it will be found that for the first 2 years or so to make full use of the fertiliser response practically all the season's ewe lambs will need to be retained and, if any real culling is to be done, some of the best wether lambs also to provide the increased stocking recommended. On country carrying 1½ to 2 ewes per acre, of course, the rate of progress can be quicker, though where stock has to be provided from breeding it will be found that even here treating up to a quarter of the farm at a time is fast enough. The results of topdressing are wasted, however, if stock is not provided to use fully the better feed, and the more topdressed grass that can be returned to the land as dung and urine the more rapid will be the improvement in carrying capacity. Retopdressing every 3 or 4 years should maintain the improvement.





## A Report on Cypress Canker in New Zealand

CYPRESS canker is threatening the Lawson's cypress or lawsoniana (*Chamaecyparis lawsoniana* Parl.) shelter belts in the Waikato district with extinction. This disease is caused by a fungus *Monochaetia unicornis* Cke. and Ellis. It is also recorded from other districts, though not in such severity. Unfortunately it also attacks many members of the cypress family and macrocarpa (*Cupressus macrocarpa* Hartw.) is as susceptible as Lawson's cypress. The fungus kills the bark, producing cankers which cause death of twigs and branches and eventually the trees. The cankers frequently exude gum. Control of the disease in established shelter belts is impracticable. Plants should be raised from disease-free stock and in early stages of growth preventive measures should be adopted. It is recommended that in areas where cypress canker is severe shelter plantings should be confined to species which are immune or resistant to the disease. Here C. E. K. Fuller, Horticultural Instructor, Department of Agriculture, Auckland, and F. J. Newhook, Mycologist, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, describe the methods of attack and symptoms of the disease and list species of trees which are resistant or immune to it.

A RECENT survey has shown that over 90 per cent. of established shelter belts of Lawson's cypress and *C. macrocarpa* in the Waikato district are affected by cypress canker. Since Lawson's cypress is the most important shelter tree in the Waikato, the situation is causing much concern. For many years it has been recognised that this tree will not tolerate wet soil conditions, and previously unthriftiness and death of the species have been attributed to this cause. Cypress canker and "wet feet", however, are two quite independent conditions, though both may affect the same trees. From surveys and examination of specimens it is evident that

it is cypress canker which is causing most damage in various parts of the country. Present indications are that many of the affected shelter belts will need replacement within a few years.

### The Disease

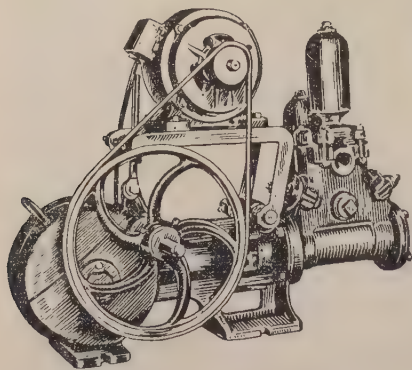
Birch (1933) reported cypress canker as widespread in the Auckland, Waikato, and Wairarapa districts. He attributed the disease to the fungus *Coryneum* sp. Wagener isolated and described the cypress canker fungus *Coryneum cardinale* Wagener from *C. macrocarpa* and related species in California and from New Zealand. In Kenya an identical disease has been

reported as serious in plantations of *C. macrocarpa* and other cypresses, but the causal organism has been determined as *Monochaetia unicornis* Cke. and Ellis, a fungus closely allied to *Coryneum cardinale*. Investigations in Auckland, Waikato, and other areas of New Zealand have shown that *M. unicornis* is associated with most cankers, not *C. cardinale* as previously reported.

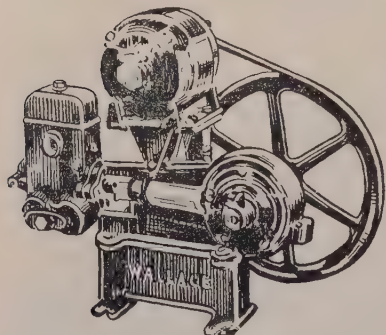
Spores of the fungus commonly enter a host tree through wounds such as those caused by insects and wind, or through cracks in axils of small, swollen twig bases. Under some conditions spores are capable of causing infection of apparently undamaged bark. The fungus usually attacks only the bark, but the wood may also be affected. The dying bark in and around a canker becomes impregnated with gum, some of which may exude to the canker surface, a symptom which has caused the term "gummosis disease" to be sometimes applied to cypress canker. As healthy parts of a stem continue to grow the diseased bark is left behind as a sunken area. Often there is an abnormal amount of growth around the canker and the

HEADING PHOTOGRAPH: A typical well-grown Lawson's cypress shelter belt 35 years old.





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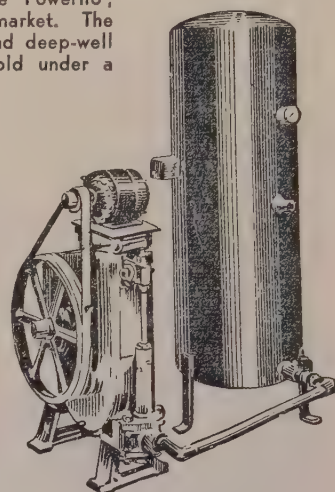
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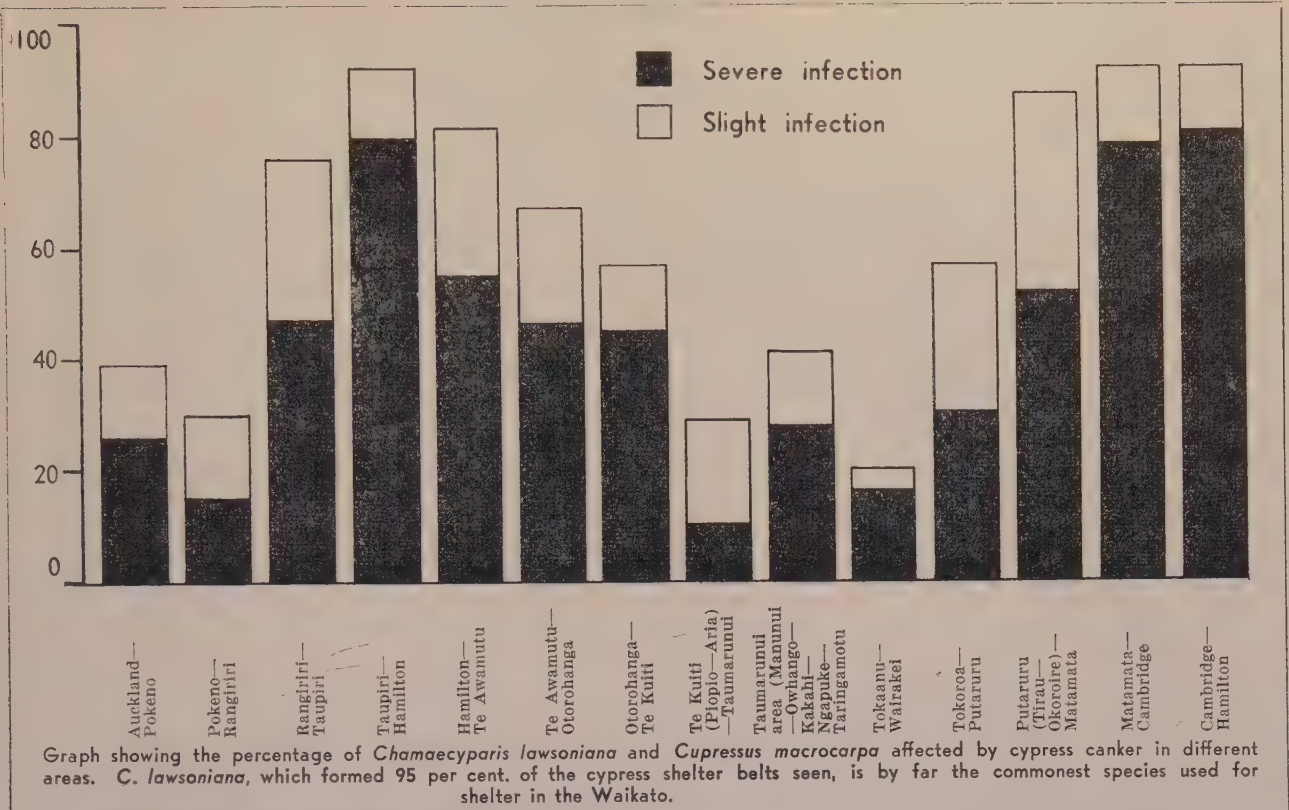
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A patch of dead branches caused by multiple cankers which have developed from rain-washed spores from initial cankers.

raised margins produce spectacular distortions. Cankers vary in length, from a fraction of an inch to several inches, and either are confined to one side of a stem or completely girdle it. They may be found anywhere from the smallest twig to the trunk. Though a single canker at the base of the trunk has frequently been observed to cause death of young trees, deterioration and ultimately death of older trees are usually brought about by the build-up of large numbers of branch and twig cankers. Spores from small black fructifications on the surface of cankers are washed or splashed by rain to other parts of the same tree or to neighbouring trees, where they may initiate new cankers. If an infection girdles a branch, the foliage turns olive green or brown and is gradually shed, leaving the branch bare. The ragged appearance due to dead or dying branches among healthy foliage is the characteristic feature of cankered trees and is distinct from the uniform deterioration of trees suffering from wet feet.

#### Distribution of the Disease

The origin of cypress canker in New Zealand is unknown, but Maxwell in his book "Afforestation in Southern Lands" (1930) wrote, "The macrocarpa has one fault, but it is apparently a slight one. It carried with it to each country where it was introduced a disease the nature of which the writer believes is so far not fully understood." This could well have been cypress canker, since planted *C. macrocarpa* in its native habitat of Southern California is highly susceptible to the disease. Under certain New Zealand conditions cypress



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Left—Typical ragged appearance of a diseased Lawson's cypress hedge. Right—An infected macrocarpa hedgerow. Note the extensive death of branches on the two near trees.

canker would appear to have found an even more ideal host tree in Lawson's cypress, as exemplified by the present position of the disease on this tree in the Waikato. Since Birch made his reports in 1933 the position appears to have deteriorated considerably, particularly over the past 6 years. Farmers in many areas are now faced with the likelihood of ultimate death of their established Lawson's cypress shelter belts.

#### North Island Distribution

**Waikato-King Country:** The accompanying graph illustrates the position today in the Waikato and parts of the Auckland and King Country districts.

**Other districts:** The disease is widespread in varying severity on *C. lawsoniana* and *C. macrocarpa* throughout the districts of Auckland and Wairarapa, with general slight infection throughout Taranaki, Wanganui, Bay of Plenty, Gisborne, Hawkes Bay, and Manawatu. As yet the disease in these areas is not as widespread or as severe as in the Waikato. The Rotorua district is remarkably free from infection, as is the Northland area, with the exception of one locality in Bay of Islands County, where there is severe and extensive infection in shelter belts of Lawson's cypress.

#### South Island Distribution

Recently the causal fungus has been recorded from specimens of *C. lawsoniana* and *C. macrocarpa* from Marlborough, Canterbury, and Otago.

#### Control Measures

##### In the Nursery

The primary point of disease control is in the nursery. A survey of 15 nurseries handling cypress species in the Hamilton district showed that 11 were affected, the degree of infection ranging from 1 to 10 per cent. of the Lawson's cypress stock planted. In

one nursery the degree of infection among several highly susceptible ornamental varieties was 80 per cent. Evidence suggested that the disease was brought in when the stock was purchased from another nursery. Infection of plants usually followed mechanical injury suffered during cultivation, such as hoe cuts on the stem at ground level. However, stem and twig infections may be found anywhere on the plant, particularly on some of the highly susceptible ornamental varieties such as *Chamaecyparis lawsoniana* var. *potteni* and

*Chamaecyparis thyoides* var. *andelyensis*, often called *Retinispora leptoclada*.

The following control measures in the nursery are recommended:—

1. Thoroughly examine all "stock trees" from which cutting material is taken. Infected parent trees should be avoided.
2. Line out cypress species in the nursery in areas well away from any affected hedgerows.
3. Minimise damage to plants during cultivation.

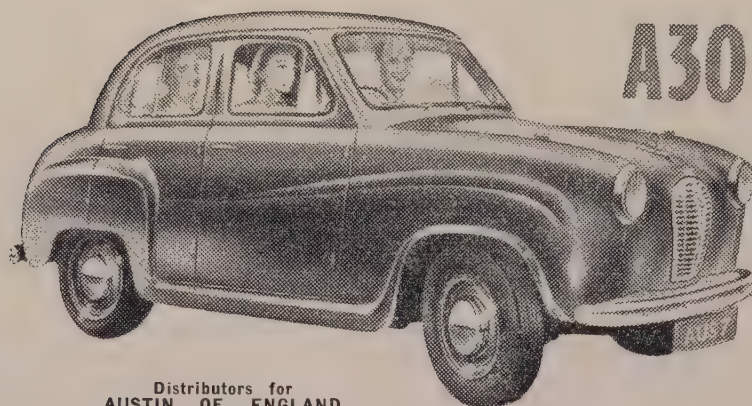


*C. lawsoniana* trees some of which, in a low, wet corner of a field, show effects typical of wet feet.





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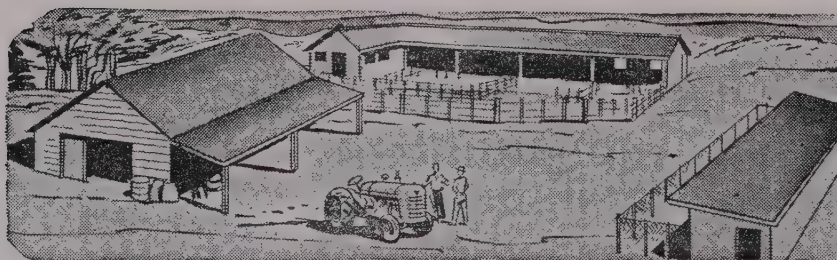
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A young *C. lawsoniana* hedge in the Okoroire district, showing the effects of wet feet in the low, waterlogged ground at right and a single though severe patch of cypress canker below the arrow on the well-drained hillside at left. There were no cankers on the trees dying from wet feet at right.

4. Overseas work has shown that the application of protective fungicides such as Bordeaux mixture to all nursery trees helps to control cypress canker. It is imperative that all parts of trees be thoroughly covered with spray, since spores may lodge anywhere on leaves, twigs, branches, or the main stem and cause infection.
5. Pull out and destroy any trees suspected of having cypress canker.

#### For Young Hedgerow Plantings and Specimen Trees

Young hedgerow plantings of Lawson's cypress and *C. macrocarpa* should be sprayed regularly for as long as is practicable with Bordeaux mixture. If, despite these precautions, cypress canker becomes strongly established, the life of the hedge may still be prolonged by spraying and by the removal and burning of as much cankered material as possible. At least two sprays a year should be applied, the first in autumn and the second in early spring before growth begins. Trees beyond hope of recovery should be removed and destroyed.

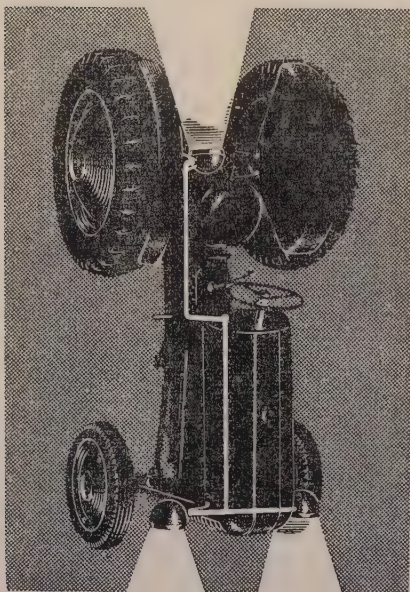
Specimen trees should be treated in a similar manner, but in many instances the removal of an affected branch will spoil the balance of a tree. In such cases, where it is practicable, individual cankers should be removed by tree surgery, that is, by gouging out the canker with a suitable tool and cutting away all dead or discoloured bark and wood well into healthy tissue. The resulting wounds should be promptly disinfected and sealed with a protective coat of



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Cypress cankers on *C. lawsoniana*. Those at right are swollen and that at left is not. Gum is showing on all cankers.



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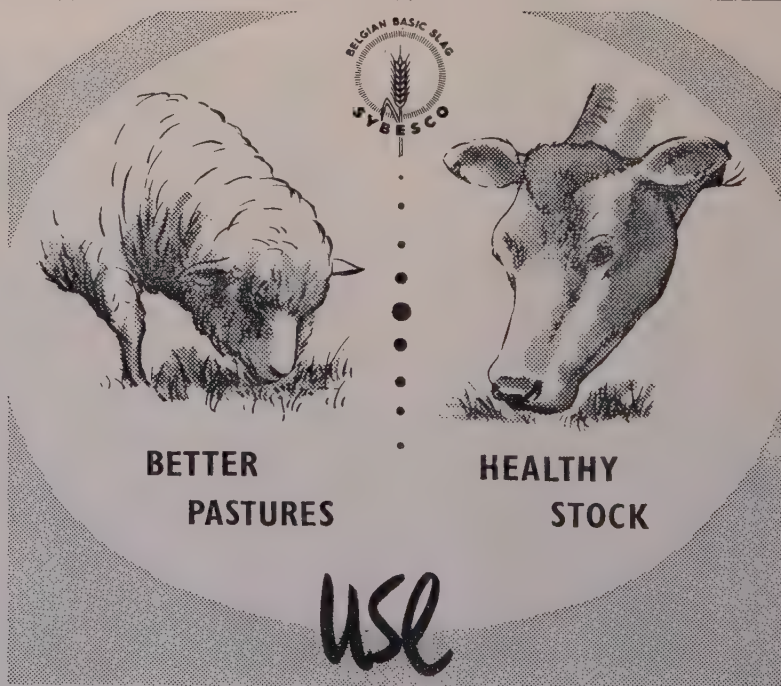
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There is no practical means of control of the disease in large hedges where the height and density of the foliage make it impossible to carry out a spray programme. At best in the earlier stages of an attack cutting out of infected tree portions may assist in delaying build-up of the disease.

The only practical means of obtaining a healthy shelter belt is to replace diseased trees with disease-resistant varieties.

#### Suitable Replacement Species

##### Conifers

In districts where Lawson's cypress and *C. macrocarpa* are becoming badly affected by cypress canker and replacements or new plantings are required certain species of conifers are available which appear to be sufficiently resistant to the fungus to be worthy of consideration. Though none of these seems to be quite equal to Lawson's cypress in growth-rate and versatility, one or two compare favourably with it. In some respects, such

as ability to stand up to wet soil conditions, the replacement species recommended may offer characteristics superior to those of the susceptible species previously favoured.

The trees mentioned below as possible substitutes have been provisionally selected as a result of field observations throughout the Waikato. These trees have been found growing in association with affected shelter belts of Lawson's cypress and *C. macrocarpa* and the evidence for resistance is strong though circumstantial. These recommended varieties are being tested by inoculation with the fungus, but results will not be available for one or more seasons.

The following trees are suggested as being suitable for single-row, major farm shelter belts. They are not listed in any general order of preference, as selection will depend largely on local conditions.

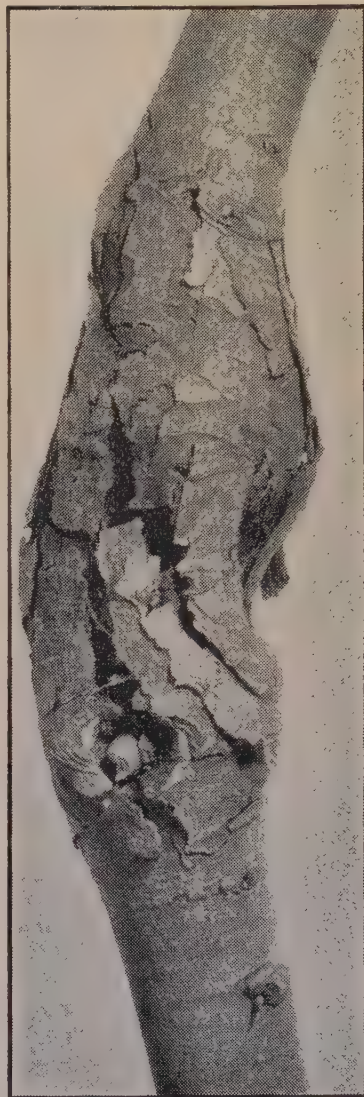
**Bentham's cypress** (*Cupressus lusitanica* var. *benthami*) will flourish on all soils in which Lawson's cypress grows and will tolerate a somewhat higher permanent water-table. This tree also does better than Lawson's cypress in the heavy and wet clay soils, it grows faster, and has a spreading habit, but is inclined to open up at the base. This habit may largely be controlled by shortening-in the green side branches. This should be done 2 years from the time of planting and every second year thereafter. The greatest possible care should be taken in buying plants of *C. benthami* because many lines of seedlings are of a very poor type. Until sources of seed are found which will provide a high proportion of plants of a good type heavy rogueing will be necessary in the nursery to secure reasonably uniform lines. This tree will stand general trimming.

**Bhutan cypress** (*Cupressus torulosa*) is a large, fine-foliaged, conical tree with short, horizontal branches turning up at the extremities and clothed right to the ground, the shelter being equivalent to, if not better than, that from Lawson's cypress. It seems to prefer well-drained clay soil, but there seems to be no reason for it not doing well on alluvial or sandy soils. It reaches at maturity a height of 40ft. to 60ft. and will stand trimming.

**Japanese cedar** (*Cryptomeria japonica*) is an excellent substitute for Lawson's cypress; it is easily grown and has about the same rate of growth. It will thrive on a wider range of soils, including heavy clay provided it does not become waterlogged. In 20 years it will attain a height of 20ft. to 40ft. It can be trimmed. Unfortunately it will not stand salt winds.

**Japanese red cedar** (*Cryptomeria japonica* var. *elegans*) thrives on heavy clay provided it is reasonably well drained, but it is also suitable for planting on silt loams. At maturity it attains a height of 25ft. to 30ft. and retains its lower branches right down to ground level. The foliage changes to a warm, reddish bronze during the colder months. This tree has the fault that it is prone to double branching, thereby creating a point of weakness under windy conditions. It should be kept to a single main trunk. It has a comparatively short life, but will stand trimming.

**Totara** (*Podocarpus totara*) will grow in shade as well as in sunlight and is able to stand severe trimming.



[Department of Scientific and Industrial Research

A very large canker 12in. long on a *C. lawsoniana* branch.



[Department of Scientific and Industrial Research

A canker half-way up the twig (in circle) has girdled the bark and caused foliage nearer the twig end to die.

Basal trimming should be given for the first few years. It is not attractive to stock and is apparently disease-free. This species will grow faster than is generally supposed and under good conditions will grow a foot or more a year.

*Chamaecyparis pisifera* var. *plumosa* (syn. *Retinispora plumosa*) has a somewhat broad conical form with horizontal and ascending branches with many horizontal lateral branchlets imparting a frond-like appearance. This species not only holds its lower branches well, but appears to stand wet soil conditions. Propagation is best done by means of hardwood cuttings.

This species and Bhutan cypress on present field behaviour merit consideration for extended planting, but unfortunately at present they are not readily obtainable.

**Western red cedar** (*Thuja plicata*) is a fast-growing tree, attaining a



height of up to 80ft., hardy, and will stand trimming better than Lawson's cypress. It will stand a wet climate better than most hedges of this type and therefore may be a good substitute in higher-rainfall areas.

#### Broadleaf Species

**Evergreen oak** (*Quercus ilex*) forms an excellent shelter screen, but should be trimmed along the base in the early years for up to 4ft. to 5ft. to thicken; it may require this treatment at intervals. In the Waikato growth reaches heights of 40ft. to 50ft.

**Chinese or large-leaved privet** (*Ligustrum sinense*) is particularly good as a single-row shelter provided it is well protected from cattle for a few years after planting. The leaves are supposedly poisonous to stock if eaten in sufficiently large quantities, and hedge trimmings should not be left lying about. (T. E. Rodda in the "New Zealand Journal of Agriculture", March 1946, states that he has not seen an animal poisoned by eating from the hedgerows.) It is a hardy plant suited to all sorts of unfavourable conditions. It may either be grown as a trimmed hedge or, if there is sufficient room, be allowed to grow unchecked. In

both cases it retains its bottom branches for long periods. If trees are trimmed, the first year's cut should be light, and there should be a heavy cut at the end of the second year to encourage a large number of strong basal shoots. Moderate trimming is needed for the next 3 years, after which the trees may be left untended. Cattle will keep back the tips of the bottom growth, and there will be a dense overhead shelter that provides shade and protection from wind and rain.

#### Mixed Shelter Belts

Lombardy poplar (*Populus nigra* var. *italica*) is suitable for some districts and can be interplanted with barberry, pampas grass, or New Zealand flax.

Eucalypts suitable to the locality may be substituted for the Lombardy poplars. The Chinese poplar (*Populus yunnanensis*), which will grow to 30ft., combined with barberry is suitable for a low screen.

#### Selection of Resistant Forms

One other possibility which, though it offers no immediate aid, may in the future provide an additional method of overcoming canker is the development of resistant forms of cypress from which planting stock may be

vegetatively propagated. In the Waikato, where the disease has been prevalent for many years, occasional perfectly healthy trees of Lawson's cypress may be seen in badly affected hedgerows. Though it may be merely by chance that trees have escaped infection, there is a possibility that such trees are inherently resistant to the causal fungus. Vegetative propagation from these trees may produce lines of resistant cypress, but much testing would have to be done to guarantee freedom from infection when such trees are planted in a district such as the Waikato.

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## Frame for Making Farm Gates

ON every farm the making of gates forms a part of the normal farm management and this job is usually carried out at odd periods during wet weather. When the farmer has a few hours at his disposal a simple frame for constructing gates quickly is a great advantage, particularly where large numbers of gates of varying sizes have to be made. A simply built frame suitable for making gates up to 11ft. wide is illustrated. The only timber required is 4in. x 2in. pinus and 5 or 6 pieces of 4in. x 1in. timber for bracing. The frame can be made to any size to suit a farmer's individual requirements and it is equally useful for constructing single- or double-head gates.

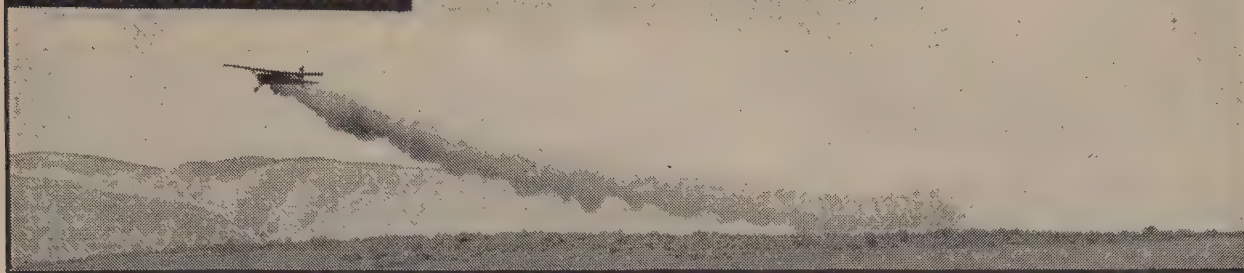


When large numbers of one-pattern gates are to be made a piece of mortised 4in. x 2in. timber is used to space the panels. For shorter gates a removable piece of 4in. x 2in. timber can be placed at any distance within the length of the frame to control the length of the gate. Small pieces of 1in. x 1in. timber can be cut to required lengths for use as distance pieces when gates of different gauged panelling are being made.

—R. H. LAWRENCE,  
formerly Instructor in Agriculture,  
Department of Agriculture,  
Hastings



## LAND IMPROVEMENT



# Aerial Topdressing Costs

IMPROVEMENT of large areas of hill country has been facilitated by the use of aircraft to spread fertiliser and seeds and considerable interest has arisen in the cost of carrying out this work. To obtain cost data the Department of Agriculture carried out a survey in some North Island districts and the results are given in this article by R. H. Scott, Land Utilisation Officer, and G. Mason, Research Officer, both of the Department of Agriculture, Wellington.

THE quantity of fertiliser dropped from the air has increased rapidly over the past few years and it appears that there will be a continued increase for some time, but it is not likely that the rate of increase as shown in Table 1 can be maintained.

| Year ended 31 March | Weight distributed tons | Area treated acres |
|---------------------|-------------------------|--------------------|
| 1950 .. ..          | 5,000                   | 48,740             |
| 1951 .. ..          | 44,820                  | 428,740            |
| 1952 .. ..          | 88,870                  | 829,580            |
| 1953 .. ..          | 144,800                 | 1,376,000          |

The quantity of fertiliser dropped from the air for the year ended 31 March 1953 represented approximately one-fifth of the fertiliser delivered to farmers during that year.

## Scope of Survey

Data on the cost of constructing airstrips and of applying fertiliser by aircraft to hill country farms were obtained from 40 farmers on the east coast of the North Island, in the Manawatu and Taihape districts, and in Taranaki, and applied mainly to costs during 1953.

## Costs

**Cost of constructing airstrip:** Naturally there was a large variation in this cost, owing to such factors as the topography of the farm, length of access track to be constructed to the airstrip, and the necessity or otherwise of removing obstacles such as trees. In a few instances considerable expense was incurred in altering the position of electric power lines. The average cost of constructing airstrips in the four districts and the range of costs are set out in Table 2.

TABLE 2—AVERAGE COST OF CONSTRUCTING AIRSTRIPS AND RANGE OF COSTS

| District                | Average cost £ | Range of costs £ |
|-------------------------|----------------|------------------|
| Gisborne-Wairoa ..      | 435.68         | 109.7 to 1749.75 |
| Hawkes Bay-Wairarapa .. | 237.07         | 101.95 to 711    |
| Manawatu-Taihape ..     | 251.45         | 98.33 to 541.75  |
| Taranaki ..             | 710.03         | 122.35 to 1967.2 |

The average cost for all airstrips for which information was obtained was £410.7.

The main costs in constructing an airstrip are for bulldozing and grading the site and access tracks. Other items are tractor and implement costs for cultivating the strip, labour, and the cost of fertiliser and seed.

**Cost of spreading fertiliser by aircraft:** Data were collected on the costs incurred to spread fertiliser on a particular block of country. In all cases the amount spread averaged 2cwt. of superphosphate per acre, so this figure is used in the computations.

The average cost over all the farms was £1 13s. 5d. per acre and the majority of farmers incurred a cost between £1 10s. and £1 14s. per acre.

TABLE 3—COST OF SPREADING SUPERPHOSPHATE BY AIRCRAFT AT 2CWT. PER ACRE

| Cost per acre s.      | No. of farms |
|-----------------------|--------------|
| 28 and under 30 .. .. | 3            |
| 30 and under 32 .. .. | 14           |
| 32 and under 34 .. .. | 8            |
| 34 and under 36 .. .. | 3            |
| 36 and under 38 .. .. | 7            |
| 38 and under 40 .. .. | 2            |
| 40 and over .. ..     | 3            |
|                       | 40           |

The cost between districts varied a little, the highest average cost being for the Gisborne-Wairoa district, largely because of the greater cost of rail-fertiliser to that area. The components of cost per acre for each district are set out below.

In Taranaki the portion of the cost taken up by railage is small. In this

TABLE 4—COST OF SPREADING SUPERPHOSPHATE BY AIRCRAFT AT 2CWT. PER ACRE IN FOUR DISTRICTS

| Cost components                                          | Gisborne-Wairoa £ s. d. | Hawkes Bay-Wairarapa £ s. d. | Manawatu-Taihape £ s. d. | Taranaki £ s. d. |
|----------------------------------------------------------|-------------------------|------------------------------|--------------------------|------------------|
| Cost of fertiliser ex works .. ..                        | 18 11                   | 18 11                        | 18 11                    | 18 11            |
| Railage on fertiliser .. ..                              | 7 8                     | 3 0                          | 2 10                     | 6                |
| Cartage cost from rail to airstrip ..                    | 3 7                     | 2 11                         | 1 8                      | 2 6              |
| Labour provided by farmer at airstrip ..                 | 3                       | 7                            | 5                        | 3                |
| Aerial spreading cost by aircraft ..                     | 4 9                     | 6 10                         | 6 6                      | 8 0              |
| Annual interest on capital invested in airstrip .. ..    | 6                       | 5                            | 8                        | 1 2              |
| *Other .. ..                                             | 1                       | 1                            | 6                        | 3                |
| Cost per acre to spread 2cwt. superphosphate, etc. .. .. | 1 15 9                  | 1 12 9                       | 1 11 6                   | 1 11 7           |

\*Includes such costs as annual maintenance of airstrip and value of accommodation provided for aircrew by farmer.

district a considerable amount of the superphosphate is now carted in bulk from the fertiliser works at New Plymouth to airstrips.

## Types of Aircraft

In this survey most of the work was done by Tiger Moth aircraft, except in Taranaki, where all farmers in the survey had the work done by Beaver aircraft. Table 4 shows that the difference in cost to the farmers with the different aircraft was relatively small. The actual cost per acre for the aircraft was slightly higher in Taranaki, but this was offset by more efficient methods of handling the fertiliser from the works to the airstrip.

## Group-operated Airstrips

Because of the relatively high cost of constructing airstrips in some hill country areas, a development which is a feature in Taranaki is for a group of farmers to form a private company and obtain a lease of an area of ground on which to construct an airstrip. In North Taranaki a private company was formed the capital of which was small, but the members made loans to the company, these loans being non-interest bearing but repayable in 5 years. The loans met the cost of constructing the airstrip.

The land on which the airstrip has been constructed is held under licence from a member farmer for 10 years with a right of renewal for a further 10 years and the licence fee is 1s. per annum. The farmer grazes the airstrip.

For the first year the company charged the farmers an airstrip fee of 10s. per ton for fertiliser flown from the airstrip, but this is being reduced to 5s. per ton. This fee covers repayment of the loans made by members and also incidentals such as the secretary's fee.

Heading photograph by National Publicity Studios.



# Common Troubles in Household Poultry

**M**OST household poultry keepers are called on from time to time to deal with some vice or disease which has broken out in their flocks. Some of the more common ones, such as egg eating, feather eating, cannibalism, and bumble foot, are discussed in the following article by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

**E**GG eating is a trouble which can occur at any time, but is more particularly associated with the flush of the laying season. The shells of the eggs often get thin at this time of the year through heavy laying with the result that a number may get broken. Any hen will eat an egg once it is broken, but the real culprit is the bird that develops the habit of deliberately breaking an egg and eating it.

Overcrowding, lack of nests, and a poor diet may all lead to eggs being broken, thus encouraging egg eating.

Preventive measures, such as using mustard in a decoy egg or cutting the hens' beaks to deter them from pecking are of limited use. There is only one effective remedy: It is to find the hen which is deliberately breaking eggs and eliminate her from the flock. Eggs should be collected three times a day during spring, twice in the morning and once in the afternoon. There should be at least one nest for every 5 or 6 birds so that too many birds will not endeavour to crowd into any one nest. Finally, an adequate supply of clean lime grit or shell grit must be available to the birds at all times.

## Feather Eating

Feather eating, which is common in far too many flocks, is usually regarded as a vice, but may be brought about by bad management. The most frequent deficiency in feeding leading to this trouble is that of common salt. Over-crowding, particularly among birds housed intensively, often leads to feather eating. Highly nervous birds are more prone to this trouble than those which are quiet. Often feather picking will start for no apparent reason.



Bumble foot, which is caused by an injury to the sole of the foot.



Hard balls of dirt stuck to a bird's claws which have been caused by keeping the bird on dirty, damp litter.

## Cannibalism

Cannibalism can result in a large number of deaths, particularly among chickens. Once the habit has been acquired, it spreads rapidly through a flock. The origin of the habit is sometimes obscure, but a lack of salt or meat meal appears to have been responsible for many outbreaks of cannibalism. Once birds have acquired the habit through attacking diseased fowls they may turn their attention toward healthy birds. Attacks frequently result in almost complete disembowelling of the victim, the intestines being pulled through a hole made in the cloacal or rectal wall.

### Suggestions for Household Poultry Keepers

1. Isolate or sell all male birds immediately the breeding season has finished.
2. Gather eggs at least twice a day.
3. Protect eggs from sun, heat, and bad odours.
4. Keep eggs clean by providing clean houses, plenty of clean litter on the floor, roomy nests, and by changing nesting material frequently.
5. Feed plenty of fresh greens supplemented with a good fish oil (3 tablespoons of oil to every 10lb. of mash).

Stockholm tar dabbed on the injured parts has been found effective in preventing further attacks.

Toe picking is common among chickens, particularly those reared in a battery brooder. Toe picking results from chickens pecking at food stuck to the foot, with a result that blood is drawn. A good depth of broken-down litter should be maintained in the brooder house at all times and overcrowding should be avoided at all costs.

## Bumble Foot

Bumble foot is the term applied to a swelling of the soft pad on the sole of a fowl's foot with the formation of a "cheesy" type of abscess. The infection gains access from injuries such as bruising when heavy birds jump from high perches to hard ground or

those caused by thorns and thistles. The only effective treatment is to open the abscess and squeeze out the cheesy core. The foot should then be treated with an antiseptic and the hen placed in a pen on clean straw and without a perch.

## Blood Spots

Most people who eat eggs are familiar with blood spots and much more repugnance is often manifested toward them than is perhaps warranted. A blood spot on the yolk of an egg is the result of a rupture of a small blood vessel. One does not care to eat an egg containing even a small blood spot, but it is quite all right for cookery. Blood spots appear most frequently when pullets come into heavy egg production. The trouble will usually right itself immediately the fowls ease off in production.

## Soft-shelled Eggs

Soft-shelled eggs are usually due to a deficiency of calcium in the diet and occasionally to disease. Over-fatness and severe fright can also cause the trouble. The tendency to lay thin-shelled eggs can be inherited, which emphasises the need for hatching chicks from first-class eggs.

An abundance of shell grit should be available to the birds at all times.

## Double-yolked and Double-shelled Eggs

Double-yolked eggs result from the liberation in rapid succession of two yolks into the ovary which pass down the oviduct together and are enclosed in one shell.

Double-yolked eggs are common among pullets coming into lay, but the birds soon revert to laying normal eggs. Where pullets which have been in lay for some time appear to be laying an abnormal number of double-yolked eggs it may be desirable to cut down the meat meal in the mash for a short time or to bulk the meal by including finely chopped green food in the daily mash.

Double-shelled eggs occur when for some reason, such as severe fright, the egg is forced back up the oviduct and then passes the shell-secreting portions of the oviduct a second time.

Photographs by Niederer.



# Storage of Fruit from the Home Orchard

**M**ANY home orchardists produce a far greater quantity of fruit than can be used as it is harvested, but if they provide good storage conditions, pick fruit at the right stage of maturity, and avoid rough handling, they can have home-grown fruit until late in the year. In this article J. Coombe, Horticultural Instructor, Department of Agriculture, Christchurch, describes methods and conditions which reduce the risks of rots developing and assist the fruit to retain its good eating qualities.

**I**N the main, stone fruits are unsuitable for storage, except under ideal conditions, such as those provided by properly equipped cool stores. Even under the best of conditions the storage life of stone fruits is limited to from a few days to several weeks according to the kind and variety.

Some varieties of pears can be kept in good condition for a month or two when shed stored in the proper manner and some varieties of apples can be held for several months. One of the main points is to store only varieties which are known to be good keepers.

The mid-season or late varieties of all kinds of fruits keep in good condition much longer than earlier maturing ones. Anyone contemplating planting fruit trees with the idea of providing a supply of fruit for the home over as long a period as possible would be well advised to consider including some of the following varieties of apples and pears for storage:—

## Apples

Dessert: Rokewood, Tasma, Dougherty, Delicious.

Culinary: Ballarat, French Crab.

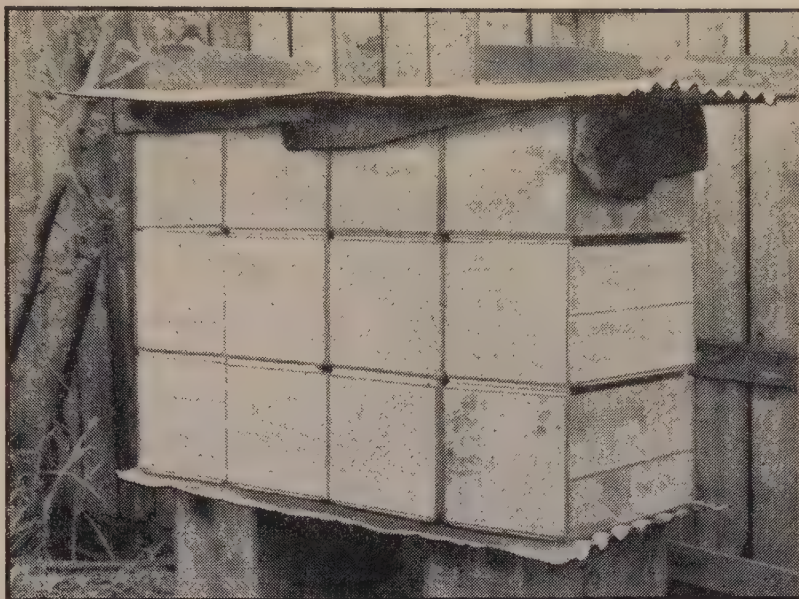
Dual purpose: Sturmer, Granny Smith, Statesman, Rome Beauty.

## Pears

Dual purpose: Winter Nelis.

Culinary: P. Barry, Vicar of Winkfield.

The above-mentioned varieties have not been selected for their flavour and



Bushel cases used for storing fruit.

good eating qualities, but mainly for their ability to hold in good condition for long periods when home stored. Rokewood, for instance, is much inferior to Delicious as an eating apple, but it will remain in good edible condition for a very long period.

Numerous varieties of apples other than those mentioned which will hold quite well in shed storage are grown in home orchards. Those who are uncertain about the keeping quality of any variety should seek advice from their nearest Horticultural Instructor. The local Instructor would also be able to give full information on the most suitable varieties to plant in the district for fruit for storing.

## Harvesting

The greatest care is necessary when fruit intended for storage is being harvested and handled, as two of the main causes of rots developing are bruises and skin punctures which occur during these operations. Not only do defects cause the damaged fruit to rot, but they are frequently the cause of rot starting in fruits which may be touching a damaged one. Both bruising and skin punctures can be avoided by careful handling during harvesting and sorting before storage.

A cane basket or bucket is better than a bag for picking, especially for fruit picked from a ladder by an inexperienced worker. When a bag is used on a ladder the fruit is often bruised through the operator leaning over and thereby squeezing the bag of fruit against the ladder or a branch of the tree. These bruises may not show up until several days later, and if the fruit is put into storage immediately after harvesting, the damage is not noticed until rots start.

The storage life of fruit is greatly influenced by the stage of maturity at which it is harvested. All fruits on a tree do not mature at the same time; also there may be some days difference in the maturity of fruit from trees of the same variety growing in the same garden, if there are differences in the vigour of the trees. The more vigorous ones mature their fruit some days later than the weaker-growing trees.

Immature fruit is not suitable for storing, as it will quickly shrivel and toughen and will not develop full flavour and crispness. Overmature fruit is equally unsuitable, as it will not hold for long in a good, crisp condition. It goes mealy or dry and loses its flavour very rapidly.



Trays used for storing fruit. Each tray holds one layer.



To get the best out of a crop it should be harvested as it matures, and usually several pickings must be made. The fruit at the top and around the outside of the tree, where it receives more sunlight, matures first; that in the centre and lower portions of the tree may have to be left for 10 to 14 days after the first picking was made.

The correct stage of maturity of fruit ready for harvesting is indicated by several features. The first and most important of these is the change that takes place in the ground colour of the skin. On green-skinned varieties such as Ballarat and Sturmer the skin changes from deep green to a much lighter shade of green or to yellowish green. Even on a highly coloured variety such as Delicious it is better to be guided by the change in the ground colour than to take too much notice of the blush or stripe on the fruit.

A further guide to maturity is the readiness with which the fruit parts from the spur or lateral when it is lifted up. Fruits which have to be tugged or pulled from the tree are not sufficiently mature for harvesting. When the fruit is lifted upward with a slight twisting movement it should readily part from the tree without injury to the spur, loss of stem, or rupture at the base of the stem.

The pips change from white to brown or black as the fruit matures.

This change is not a good guide by itself, as sometimes the pips change colour before the fruit is ready for picking.

Flavour can also be a useful guide; it should be characteristic for the variety and the flesh should be crisp. Crispness can also be detected when the fruit is cut. If it is immature, it is hard to cut and has a woody feeling, but when mature it can be cut far more readily and has a brittle feel as the knife penetrates the flesh.

When an apple is cut in halves from cheek to cheek a green circle around the core can be seen in the flesh. This line fades out, leaving small greenish points, as the fruit matures. Also the juice in the fruit rises quite readily to the cut surface when cut in the above manner, if slight pressure is put on the fruit by squeezing. If a good deal of pressure has to be exerted to make the juice rise, the fruit is not sufficiently mature for storage.

**Once the fruit has been picked it should be placed in a shady position immediately to keep it cool.**

### Sorting

After harvesting, the fruit should be sorted carefully and any showing defects put aside for immediate use. Fruits damaged by chewing insects such as codling moth, leaf-roller caterpillar, or bronze beetle should be separated from those intended for

storage. Apples infected with the fungous disease ripe spot should be put into separate containers for use before decay sets in. Fruits which have had the stems pulled out in harvesting and excessively large fruits should not be stored.

On no account should fruit intended for storage be tipped from box to box, as this causes bruising. It should always be handled carefully. Boxes should not be filled to such an extent that the fruit projects above the top, as damage will occur if another case is placed on top.

### Storage Conditions

Care is needed in selecting the place for storing fruit, if it is intended to keep it until late in the year (September to November according to the variety). A cool position where the temperature fluctuates as little as possible and where ventilation is good should be selected.

Low, iron-roofed sheds are generally very unsatisfactory, as the temperature in a building of this type varies considerably with the weather. Good positions for storing fruit are:—

1. Inside a brick or concrete shed which has a high ceiling, provided the fruit is placed on the south or cool side of the structure and ventilation is possible.
2. In a cellar which can be ventilated.
3. On the outside of a shed or building where it does not get the sun.
4. Under evergreen trees, such as macrocarpa, where it is cool and the sun does not penetrate.

The cases containing the fruit should not be placed on the ground or even on bricks, as this is likely to attract slaters, which will cause severe losses by chewing into the fruit. Protection from rodents is also necessary. Rats can destroy cases of fruit in a very short time by biting the fruit to pieces to get the pips.

The best method of preventing rats from destroying the fruit if it is stored outside is to build a stand about 18in. high and place a sheet of iron on the top so that the iron projects some inches out from the stand on all sides. The stand should not be too close to a building, as then rats and mice can climb up the building and reach the storage stack.

Each layer of cases should be separated by battens to allow about 4in. between cases for ventilation. These battens should be placed one at each end of the case so that the weight is carried by the ends and not by the thin timber on the sides. After the stack has been completed it should be covered with canvas or sacks to keep out frosts and drips of condensation from the iron covering. Freezing of fruit will cause it to go mealy very quickly and will shorten its storage life considerably. Finally, a sheet of iron should be placed on top of the sacks or canvas to keep the fruit dry and to prevent damage by rodents and birds.

By following the recommendations set out in this article—harvesting at the correct stage of maturity, care during handling, and storing only sound fruit of suitable varieties in a good position—it should be possible to have home-grown fruit throughout most of the year.

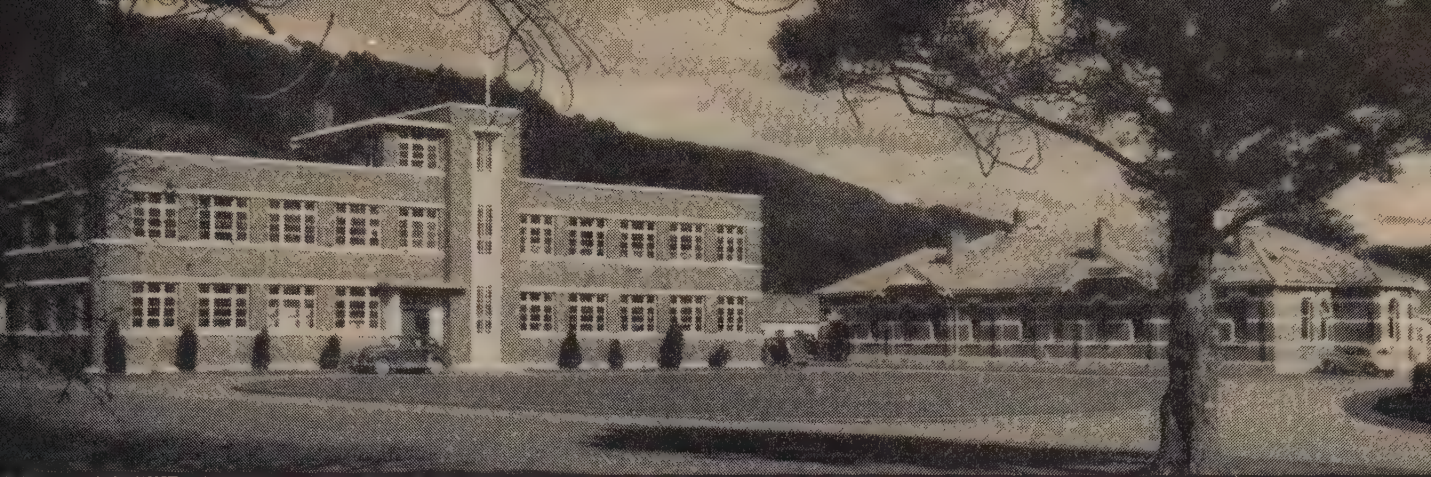
## Facial Eczema Warning

**T**HE long, continued spell of hot, dry weather in most North Island districts makes it necessary for farmers to prepare detailed plans for preventing facial eczema in those districts where this disease is known to occur. Existing conditions are more potentially dangerous than any which have occurred since the disastrous outbreaks in 1938.

Signs of liver damage have already been seen in lines of lambs killed at meat works, indicating that rains which fell in February in some districts produced dangerous pastures. Though sheep in these districts have shown no obvious signs of facial eczema, they may have slightly damaged livers and consequently will be especially susceptible in the future.

If warm, showery weather occurs before the end of April, there will certainly be serious losses from facial eczema unless effective measures are taken to prevent them. Sheep and cattle must not be allowed to eat the extremely dangerous pasture which will grow under such conditions. Detailed protective measures for different types of stock were given in the January issue of the "Journal", and advice may be obtained from officers of the Department of Agriculture. Official warnings will be issued over the radio and in the Press when conditions become dangerous in any district. However, where local rains are sufficient to produce a flush of greenfeed farmers should act immediately without waiting for such warnings.





## Modern Aids in the Diagnosis and Control of Disease

**N**EW results in diagnosis and control of animal disease rather than new methods were emphasised by I. J. Cunningham, Superintendent, Department of Agriculture Animal Research Station, Wallaceville, in a paper presented at last year's Ruakura Farmers' Conference Week at Hamilton. It is necessary to be able to recognise a disease and identify it each time it comes up before a start can be made to do anything about it. Treatment is the next step; prevention is the ultimate aim, for then there will be no worry and labour in attending sick animals and no loss of production during their illness and convalescence. The paper presents for representative diseases the main developments that have taken place over approximately the last 5 years, observations and findings by workers in this field in New Zealand being largely used for illustrations.

### DIAGNOSTIC WORK

**T**HE ability to diagnose disease requires knowledge of animals and their functioning, and knowledge of disease. Efficient diagnostic work therefore needs trained veterinary surgeons in the field and in the laboratory. One of the most important advances in field diagnostic work has been the increases in numbers of veterinary surgeons in New Zealand arising largely from the extension of the club movement. This has meant that considerably more diseased animals have been examined by persons whose training has equipped them to recognise the cause of the disease. The following are three recent examples where the diseases may not have been diagnosed or may have escaped recognition for some time but for the availability of veterinary advice. Scrapie was recently found by a club veterinarian and a Government field veterinarian in sheep imported from Great Britain into the South Island. This disease is caused by a virus which attacks the nervous system and causes intense itching, interference with ability to move, and eventual death. Its danger lies in a very long incubation period, its slow, steady spread, and the absence of any means of control. The identification of scrapie at what is hoped is its first appearance allowed the slaughter of possible affected animals and the prospect that the disease may be stamped out.

Hyperkeratosis in young calves was also found by the same club veterinarian in the South Island. This disease causes loss of hair and thickening of skin, chiefly round the head and shoulders, affects the mouth, stomach, and other organs, and causes gradual decline. It was caused by continued exposure to very small quantities of poisons in a wood preservative. The

disease has been known for some time in U.S.A. and on the Continent of Europe and only very recently has been shown to result from poisoning. Its diagnosis in New Zealand is a tribute to proper training and keeping knowledge up to date.

Both scrapie and hyperkeratosis have probably not occurred before in New Zealand. A third disease recently diagnosed in the South Island is Johne's disease in sheep. It seems likely that this disease has been present for some time, but the opportunity to observe it has come now through the wider distribution of men with training in the recognition of disease.

### Aids to Field Diagnosis

The field diagnoses of the diseases mentioned have been confirmed in the laboratory. A laboratory is an essential second line, because laboratory techniques very often must be carried through before a diagnosis can be considered certain. And efficient laboratory aids to diagnosis depend on specialised knowledge and the acquisition of specialised techniques. When these have been acquired a laboratory worker can frequently suggest a diagnosis from the examination of specimens submitted from a case that is puzzling in the field. This was the order of events with salmonella infections. These germs are often difficult to grow and might not be detected unless special methods are followed. When one man had the interest and the time to undertake a special study of salmonella he learnt how to grow these organisms and to become reasonably certain from examining specimens whether the germs were present or not. In other words he became especially proficient in the laboratory diagnosis of salmonella infection. When this test was applied in appro-

priate cases it became known that disease caused by salmonella infection was present not only in fowls and pigs but also in cattle, sheep, and horses. The laboratory diagnostic range was increased by a specialised tool, a man with time to concentrate on and study a particular family of bacteria.

Development of techniques in a similar way enabled the diagnosis of germs called leptospira as the cause of redwater in calves. Making a special culture medium, or food mixture, to grow the germs and learning a particular way of looking for the germs under the microscope with indirect lighting were the special features in this instance. The acquisition of these tools again means manpower, time, and special knowledge.

Another case exemplifies the importance of laboratory knowledge and technique in diagnosing in quarantined animals a disease that might, if undetected, have gained entrance to New Zealand. This disease involved a goat which aborted while in a quarantine station. Examinations made by bacteriological tests and by tests on small animals showed that the goat was infected with Q fever. Among other things this disease can cause mastitis in cattle and an influenza-like condition in man. Its stoppage at a quarantine station illustrates the important results that can come from proper laboratory skill and knowledge.

Examples of a similar nature could be multiplied for field work and for laboratory work in chemistry, pathology, and parasitology, as well as in bacteriology. The illustrations given show that the increased numbers of trained men and the acquisition of techniques and knowledge are an important modern contribution to diagnosis.

### Disease and Soil Type

Important tools in diagnosis may derive from research work carried out in fields quite unrelated to animal disease. For example, copper deficiency with or without a dangerous excess of molybdenum occurs on

**HEADING PHOTOGRAPH:** Main laboratory buildings, Department of Agriculture Animal Research Station, Wallaceville.



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particular types of soil. The mapping of these soil types has been done by soil scientists with no special application to animal disease in view. Once research from the animal disease end has shown an association of disease with soil type, however, the soil map becomes important as an aid to the diagnosis of this disease and in spreading knowledge as to its control. The map shows, within limits, where the disease is most likely to occur.

A final example concerns the close association of research and diagnosis. The study of ram epididymitis and ewe abortion has led to the identification of a new member of the brucella family of germs as the cause of this disease (or these diseases). Once the germ had been identified it was possible to learn that the one germ could cause epididymitis in rams and abortion in ewes; to learn in fact that there was one disease with one manifestation in males and another in females. It is possible also, at least in experimental animals, to be more precise in diagnosis, and, by isolation of the particular germ, show that the disease investigated is that caused by the brucella organism and is not another disease with similar clinical signs. Further research holds out the possibility that a blood test may be worked out so that it will become possible to determine whether infection has occurred in a ram or a ewe.

With the aids of diagnosis exemplified as shown 29 diseases have been recorded in New Zealand for the first time during the past 5 years. All of these are of importance to animal welfare and some are of considerable economic significance.

## TREATMENT

In treatment of disease the introduction of sulpha drugs and antibiotics stands out as the paramount new development. These drugs have been used in treatment of a number of diseases due to bacterial infection, in control of infection after surgical operations, and in infections occurring after accidental injury. It is not intended to deal with anything but the use of these drugs in some diseases that occur commonly on the farm.

### Sulpha Drugs

Sulpha drugs have been of value in the treatment of foot-rot in cattle. Not all foot lamenesses respond to this treatment and proper differential diagnosis is necessary to ensure that the drug is employed in cases due to bacterial infection. Some have denied the value of this drug for treatment of foot-rot, but there is general belief in its effectiveness in New Zealand in clearing up infection and returning the foot to normal without need of surgery or of a prolonged course of treatment. Sulpha drugs are probably also of value in the treatment of foot abscess in sheep. If untreated, this condition is likely to run a very long course and result in serious loss of condition in ewes or of work that can be got from rams. The present indications are that one or two doses of sulphanilamide or sulphamezathine by mouth will clear up the foot if the treatment is given in the early stage before an abscess core is formed.

### Antibiotics

Antibiotics have been employed in treating a large number of diseases,



Lesions of scrapie in a sheep.

but mention will be made only of redwater in calves, blackleg in sheep, and mastitis in cows, as these illustrate particular points in the use of these drugs.

### Redwater in Calves

Redwater in calves, as mentioned earlier, is the result of infection by a germ called leptospira. This germ is sensitive to penicillin, streptomycin, and aureomycin. Penicillin is the cheapest and most readily available of

these drugs and is one now kept in most farm sheds. It is the one most likely to be chosen for treatment. There are, however, good reasons why penicillin should not be used. Even if it is used in high doses at an early stage of the disease, it is likely to effect only an incomplete cure. The clinical signs can be cleared up, but the calf may be converted into a chronic carrier of the disease and become a menace to other animals on the farm and, incidentally, to the humans on the farm.

Streptomycin or aureomycin is much more likely to give a complete bacteriological cure and eliminate the chronic carrier state. All of these drugs are more effective the earlier they are used and give better results when employed at the earlier stages when the only sign is a rise in temperature and when the easily seen passing of red water is not present. Cost is an important consideration which also governs the choice of a drug in such cases. The dose of streptomycin likely to be effective costs on present prices about 15s., and of aureomycin about £4. Obviously then streptomycin would be the most suitable of the drugs possible. The important lesson from this work is the danger of accepting the effect of penicillin as a cure; the apparent cure leaves behind a carrier which may be very dangerous in the herd.

### Blackleg in Sheep

Blackleg in sheep is a disease with a very rapid course between first symptoms and death; it kills so quickly that treatment is nearly always impossible and prevention by vaccination is the only sensible course. There may be circumstances in which preventive treatment is worth while. In a flock in which vaccination has not been carried out blackleg may occur in some of the ewes to lamb first. Unless there is a very wide spread of lambing, it will be too late to protect the remaining ewes by vaccination, because at least a fortnight must elapse after vaccination



Hyperkeratosis in a calf.



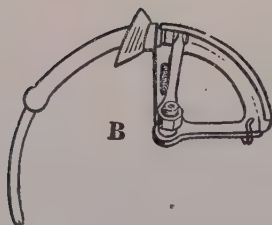
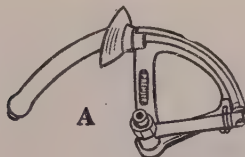


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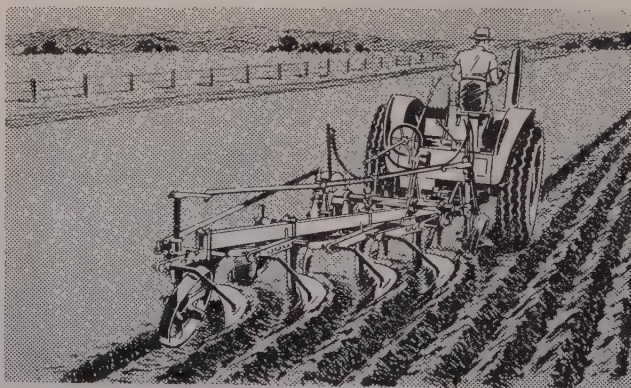
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before protection develops. In such circumstances it is sound practice to administer half a million units of penicillin to every ewe that is assisted at lambing; that is, to the ewes most likely to be infected. Tests have shown that a dose of this kind will protect a sheep from a heavy infection with the blackleg germ even if this treatment is given up to about 6 hours after infection has occurred.

### Mastitis

Mastitis is a particular case where penicillin has undoubted value in treatment and has possibilities also in control by elimination of the most important mastitis producing germ from the environment of the cow.

The value of penicillin in treatment is accepted in all countries, including New Zealand. When attempts were made to measure the effectiveness of treatment several years ago it appeared that about 4 out of every 5 cows were cured by the first course of penicillin. The proportion of cases which respond to treatment is possibly higher now, for farmers know that the earlier the treatment the better the results. With a drug they can rely on right at hand it has paid them to develop, and they have developed, a greater clinical acumen and are recognising infection at an earlier and more easily treated stage.

The effectiveness of penicillin treatment in saving quarters and thus avoiding the need to cull cows is indicated in the Dairy Board Annual Report for 1951. In 1950-51 mastitis was responsible for 8 per cent. of cow wastage, whereas in the 5 years before 1943, when penicillin was not in use, mastitis caused 22 per cent. of the wastage. No exact data are available to show whether there is a reduction of the clinical cases requiring treatment, but the consumption of penicillin still appears to be as high as in the earlier years, which suggests that approximately as many clinical cases still occur. Variations in the dose of penicillin to improve treatment have been tried overseas, but there is no evidence that these are better than the New Zealand recommendation to inject a tube delivering 25,000 units of penicillin into the affected quarter each day for 3 days. Aureomycin may sometimes be of value where penicillin fails.

The use of penicillin to control mastitis by "blitzing" streptococcus mastitis out of a herd was suggested in Britain and a fair measure of success has been claimed in that country. This is not the case in New Zealand or, incidentally, in Australia. In this country attempts to eliminate the streptococcus germ from the herd have been made by treating cows when they are dried off, or by frequent bacteriological testing of milk after the cows come in, and treatment of all quarters that harbour the mastitis germ even if it is not at the time causing recognisable mastitis.

No method has shown any great hope of success on a practical scale. In all herds there has been a reduction in the number of cows infected with the streptococcus of mastitis and of clinical cases of mastitis due to this germ. Some herds have been freed of the germ for periods, but in almost all, infection has reappeared. It has not always been possible to trace the

reason for breakdown. In many cases it appeared to come from chronic carriers of the germ which owners were unwilling to cull. In these infection shows up at intervals, either through a marked tendency to reinfection or because past treatments have not been fully effective. Sometimes the breakdown originated from purchased diseased cows, and sometimes newly calved heifers have come in infected. Clinical cases of mastitis still occur in these herds despite the extensive treatment. Not many are due to mastitis streptococcus and most of them respond to ordinary treatment with penicillin.

### Risk of New Diseases

Treatment itself sometimes introduces a risk of causing new diseases as a consequence of the treatment. Mention may be made of a temporary blindness in calves after treatment with phenothiazine to remove worms, and lameness in sheep dipped in the newer washes that do not contain antiseptics. The temporary blindness in calves was found to be due to photosensitivity which made the eye susceptible to damage by sunlight. The photosensitising substances came from phenothiazine, some of which is broken down by digestion, absorbed into the bloodstream, and carried to the fluids of the eye. The time of greatest susceptibility was found to be the day after treatment. The prevention was simply by keeping the calves out of sunlight for that day. As it is during the 18 to 36 hours after dosing that sunlight causes the damage, no matter when calves are dosed, even if it is after the evening milking, it is not possible to avoid shutting them up if the next day is sunny.

Dipping lameness was at first a puzzling condition, but finally turned out to be a very simple story. The modern dipping washes like derris and "Gammexane" are excellent poisons for keds and lice, but are not antiseptic. When the dips became fouled by many sheep passing through, the dip became a good culture medium for the growth of some bacteria. If a germ called *erysipelothrix* was carried into the dip, it grew well. Any small scratches on the skin were liable to infection by this germ and there was swelling following the infection. The swelling in scratches or abrasions near the hoof caused pressure inside the horn, and pain which caused lameness. This disease has been corrected by including in the dip wash an antiseptic which prevents the growth of bacteria. This is now regularly done by manufacturers, and dipping lameness is virtually a thing of the past.

### PREVENTION

On humane grounds, on economic grounds, and on the grounds of plain common sense it is clearly sounder to prevent disease than to cure it. Such is the final object of all who work with animal disease. A number of methods of prevention are in common use and of these protective vaccination against infective diseases, control of poisonous materials in the environment, and proper feeding will be discussed.

### Vaccination

Vaccination is a familiar procedure to most New Zealand farmers, many of whom themselves vaccinate their sheep against blackleg or their lambs against scabby mouth, or have their calves vaccinated to protect them against contagious abortion. Vaccines are made from dead germs or their products, and from living germs, and there are mixtures of vaccines to protect against more than one disease. Several points about these various types of vaccine are modern developments designed to give more effective protection.

### Blackleg Vaccine

Blackleg vaccine is especially well known to both sheep and dairy farmers, for it has a very wide use in New Zealand. Nearly half a million doses for sheep and 60,000 doses for calves were issued free from Wallaceville in 1949 and at that time the amount used for sheep was rising very steeply each year. The exact number of sheep vaccinated since the vaccine has been manufactured and sold commercially is not known, but undoubtedly it is several times higher than in 1949. This extensive use emphasises the importance of the vaccine and the need to be certain that it is effective.

Blackleg vaccines have passed through a number of forms in the development to the latest type. This is made by growing the germ in a suitable liquid mixture of foods for standard periods, by then killing the germ with formalin, and using the fluid mixture as the vaccine. A vaccine made in this manner protected calves and most of the sheep on which it was used. There were, however, a few

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cases of vaccinated sheep dying of blackleg.

The efficiency of the vaccine was therefore looked into. By improving the food mixture, that is, the culture medium in which the germs were grown, the protective effect of the vaccine was increased about 5 times; by treating the vaccine at the final stage with a chemical which slows down its absorption after injection the protective effect was further increased by about 25 times; and by increasing the dose from 2 c.c. to 5 c.c. there was still further increase in protection.

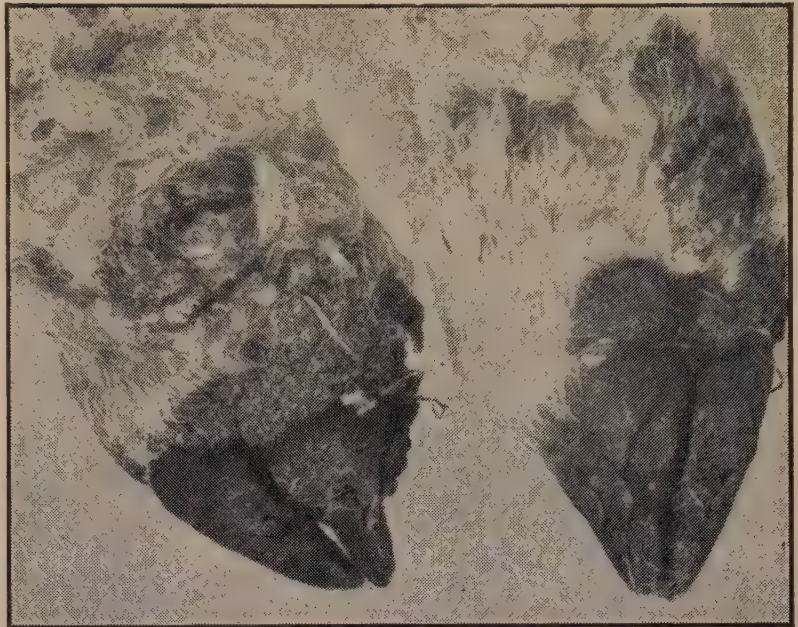
The final result is that the modern vaccine has some 600 times greater protective power than the one in use previously. Where sheep encounter a very heavy dose of infection they now all have a much greater chance of resisting it. The chance of vaccination breaking down is greatly reduced.

A comparatively recent development is the use of a combination of blackleg and other vaccines. Sometimes another germ closely related to blackleg may be present at the same time and be partly responsible for deaths due to blood poisoning. A combination of blackleg and this septicum vaccine gives satisfactory control. Blackleg and enterotoxaemia vaccines may also be made so that one vaccine gives protection against both diseases. These mixed vaccines have the advantage of saving labour and time in the work of vaccination. A mixture of blackleg and enterotoxaemia vaccine is now available from commercial sources.

#### Tetanus

Tetanus is another disease against which protection may be necessary. The disease has been known in New Zealand for a considerable number of years, but only odd cases occurred. Recently there have been more cases, especially in male lambs on which rubber rings have been used in castration. It is possible to protect animals with a vaccine somewhat similar to the enterotoxaemia vaccine. The occurrence in young lambs is a particular problem, as about a fortnight must elapse after vaccination before protection develops. No farmer desires to handle his lambs twice, once for vaccination and a fortnight later to apply rubber rings. In any event where rings are used it is good practice to apply them as early as possible. Vaccination of the mother late in pregnancy does not confer any immunity on the lamb. A method which offers some hope of practical use is the injection of a protective serum at the time of marking. There are certain difficulties and risks. The dose is about  $\frac{1}{2}$  of one c.c. and hence the job is fiddling. Care would have to be taken against artificial infection with blackleg spores on farms where blackleg occurs. Cost, apart from labour, is a few pence per lamb.

The work on controlling this disease has reached only the experimental stages and has not yet been applied on a practical farm scale. One of the difficulties is to predict on any farm the occurrence of a sufficiently high incidence of the disease to make an experiment worth while; the other is pressure of more urgent work. Tetanus control illustrates two types of vaccination for protection of lambs: Permanent active immunisation, which must be made at least a fortnight before exposure to infection, and



Scabby mouth lesions on the feet of lambs.

passive temporary immunisation made at the time infection is likely to be met.

#### Strain 19 Vaccine

Living organisms or viruses can, under certain circumstances, be employed to give protection against the disease they cause. Those in common use in New Zealand are strain 19 vaccine against contagious abortion, scabby mouth vaccine in sheep, and distemper vaccine in dogs. Vaccination against Johne's disease is under experimental trial.

Strain 19, used against *Brucella abortus* infection, is a strain that became modified in U.S.A. by growth of successive generations on artificial media. It proved capable of being used in its living state to immunise calves without infecting them, and without changing again to a virulent form. Another strain attenuated in Britain by injecting successively through guinea-pigs and known as 45/20 has the disadvantage that it does sometimes regain its virulence when used on cattle. The advantages to be obtained from exploiting chance or deliberately induced variations of bacteria are apparent from these two strains of the one organism. Work in the New Zealand environment showed that strain 19 is preferable to strain 45/20, because strain 19 immunises more effectively and it does not become virulent when used as a vaccine. Experimental observation also showed that the immunity persists for at least the first three calvings.

These remarks on the selection of strain 19 as the vaccine are made to illustrate the considerable amount of work that has to be done before a vaccine can confidently be introduced on the wide scale of this one. Vaccines seldom give 100 per cent. protection. Some animals, for reasons not clearly

understood, fail to respond by developing immunity. Sometimes a vaccinated animal will meet such a heavy dose of infection that its resistance is swamped and it develops the disease. There seem to be about 1 per cent. of vaccinated animals that succumb each year to brucella abortion. On rare occasions a number of animals in one herd have gone down and in some of these cases revaccination of all cattle to reinforce their immunity has been worth while.

#### Scabby Mouth Vaccine

Scabby mouth vaccine is another case in which the living virus of the disease is used, but in this instance no attenuation or weakening of the virus is practised. Small doses of the virus are given, usually to lambs, a very minor attack of the disease is induced, and this protects against later exposure to natural sources of the virus. There are some points about the vaccination procedure that deserve mention. Occasionally the immunity has appeared to break down. Investigation of this has shown that there is no new form of the virus present. Usually some defect in the process of vaccination has been indicated. The method used is to scratch the bare skin inside the thigh of the lamb with the pronged end of a needle from which half the eye is cut off, after dipping the prong in vaccine. If the prong is not wiped after use, it becomes packed with grease and does not carry vaccine to the scratch. Then, of course, immunity would not develop. Recently there has been an unusual form of the disease. A lesion just above the foot does not sound much like scabby mouth, but that is where the virus sometimes strikes. It is the same virus that causes the mouth form of the disease and the one method of vaccination controls both types of the disease.





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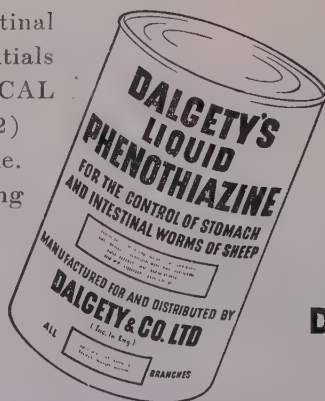


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## Johne's Disease

Vaccination against Johne's disease of cattle is carried out with the living germ that causes the disease. It is injected along with fine pumice to delay absorption and cause a localised reaction. This method of vaccination has been under small-scale experimental trial in New Zealand for several years. There are no results yet available and indeed the scale is so small that all that can be hoped for from the work is experience in the preparation and administration of the vaccine and of its side effects on cattle. From Britain, where vaccination began in 1946, promising results have come from over 320 herds, in each of which some animals were vaccinated and some were not. The incidence of the disease so far is 0.3 per cent. in vaccinated animals and 4.2 per cent. in unvaccinated animals. There are certain difficulties associated with this vaccination: Revaccination may be necessary in some cases and the tuberculin test might be affected so that vaccinated animals could cause some worry in the application of a tuberculosis eradication scheme.

## Indirect and Mixed Vaccines

There is yet another type of vaccination that may be of interest. Some germs cannot be made into a vaccine to provoke immunity against the disease they cause, but advantage can be taken of the immunising effect of closely related germs. Cowpox vaccine, for example, is used in humans to vaccinate against smallpox. It teaches the human body how to resist smallpox infection and at the same time does not incur the risk of an accidental occurrence of the very dangerous smallpox. In ram epididymitis and ewe abortion, caused by a brucella type, the need to go to related organisms for a vaccine may also arise for reasons of safety and to develop a response of immunity. The brucella which causes this disease is a melitensis variety and melitensis does not make good vaccines. Mixtures of other members of the brucella family along with *Brucella melitensis* have shown promise in overseas work. This suggests that mixtures may have to be used in protective vaccination against the sheep disease. Trials along such lines are in progress at present and therefore possibilities only are being discussed and not proven facts. The work is mentioned to illustrate the need that sometimes arises to utilise germs that do not cause the disease to make effective vaccines.

The use of a special emulsion of the vaccine in salt solution and mineral oil is also being studied in this work. The reason for this preparation is twofold. Partly it is to delay absorption, as with the chemical mentioned for blackleg vaccine and the pumice for Johne's disease vaccine, and partly the reason is to stimulate the special cells of the body which are responsible for developing the reaction of immunity.

## Salmonellosis

Salmonellosis is an example of a disease that has so far defied control by vaccination. Many attempts made in sheep and pigs have failed despite the use of vaccines made and administered with all the tricks known to give the best possible chance of immunity. At present salmonellosis remains as a disease that cannot be controlled by vaccination.

## Poisons

The next class of disease from which examples have been drawn is due to poisons either introduced into the environment or occurring naturally there. North African phosphate provides the first case. When stock are grazed on pastures recently topdressed with this phosphate cattle and sheep scour and milking cows suffer a substantial decrease in milk yield. Measurements under experiment show this drop to be about 40 per cent. The cause is at present thought to be fluorine compounds present in the fertiliser and eaten along with the fertiliser contaminating the pasture. The fluorine is more harmful if it is in a soluble form. Most natural phosphates contain fluorine, but processing, as in making superphosphate, reduces the fluorine content and decreases the poisoning effect. Control of this disease is by keeping stock off topdressed paddocks until a good rain has fallen. If pasture is grazed down hard before topdressing and stock are returned to new-grown pasture, the risk of eating fertiliser is eliminated.

## Rickets

The second disease in this category is rickets. This disease occurs in young sheep kept over the winter on green cereals, but also occurs in sheep fed on other crops or on green pasture. A single high dose of vitamin D will cure or prevent the rickets. The cause, on present evidence, is too little vitamin D and too much carotene or vitamin A in the fodder. The carotene apparently interferes in some manner with the ability of the animal to use its vitamin D and some at least of the effects of excess carotene can be overcome by providing extra vitamin D. Green feeds are rich in vitamin A and the more lush the green feed, including pasture, the higher is the carotene content. It is possible that diseases other than rickets are caused by this excess of carotene or that growth or production is affected because of the lowered availability of vitamin D. These possibilities are being investigated.

## Diet Deficiency

The final class of disease to be discussed is that due to diet deficiency and in this category the most important in New Zealand are diseases caused by deficiency of cobalt or of copper. Severe cobalt deficiency has now virtually disappeared with general use of cobalt in affected districts. A mild or borderline state of deficiency has recently been investigated. This affects young sheep, which are the animals most susceptible to cobalt deficiency, while older sheep are apparently healthy. Lambs are lighter at weaning and weaned lambs fall behind in growth during autumn and winter. Among the types of soil affected are stony soils of the Wairarapa. Parts of Wallaceville Research Station farm are involved, and an indication of the sort of effect that is obtained by dosing extra cobalt can be got from experimental work there. Lambs that have been given cobalt from weaning onward are, on the average, about 10lb. liveweight heavier by March or April, and this has been repeated in successive years. The soil map helps in generalisations as to probable areas affected and in spite of some defects has been of value in

## . . . DISEASE CONTROL—233

enabling field officers to determine the extent of deficient areas.

## Copper Deficiency

Copper deficiency also is being found in new places and in most of these new areas the deficiency of copper is influenced by too much molybdenum in the pasture. Both cattle and sheep are susceptible to this excess molybdenum, but cattle are more so, especially the calves and growing animals. It sometimes happens that cattle are unthrifty on farms where sheep do well.

In searching for and defining these deficient regions it is essential to have some basis for generalisation. A farm by farm survey, for example, would be an impossibly heavy task. Soil maps have proved to be very useful, because correlation of soil type and the amounts of copper and molybdenum in the pasture is good. The plan is to investigate copper and molybdenum contents of pasture collected from the different soil types in districts where there is any indication of these minerals being other than normal. From such work it is possible to show on a map the soils and districts where there is a deficiency of copper, alone or combined with excess of molybdenum. This information can be extended to other districts on the basis of soil types. For example, peat soils in the Waikato were first investigated in a study of peat scours; practically all peat deposits from North Auckland to Southland were later found to produce the same disease. Certain soils of North Canterbury grew copper-deficient grass and related soils in North Otago did the same. Some of the pumice soils of Wairoa grow grass very high in molybdenum and grass samples from the same kind of pumice soils near Taumarunui and north of Lake Taupo also produce grass with high molybdenum contents.

With maps constructed on the basis of pasture supply of copper and molybdenum it is possible to investigate the animal health situation more rapidly. Finally, when the validity of the maps is tested at a sufficient number of points to show that the maps represent with reasonable accuracy the deficiency or excess they can be used as a basis for field advisory work.

In addition to these studies on occurrence of deficiency the supplying of copper has been under review. Topdressing experiments on sand country have shown that 5lb. of copper sulphate per acre is effective on this soil type, as it is for peat lands. Topdressing, however, is becoming more and more expensive with increasing costs of bluestone. At present prices 5lb. of bluestone costs about 7s. 6d. and this cost must be met for each acre each year. Dosing individual animals is feasible only if it can be done at most once or twice per year. It has been found that insoluble compounds can be injected into the muscles of cattle or sheep and the copper can be used by the animal. There is risk of chance infection causing an abscess which may decrease the value of the carcass. Experiments are now being carried out to find if copper wire placed under the skin can act as a reservoir of copper. No results are yet available.



# Care of Livestock during April

Contributed by the Animal Research Division

**L**ITTERS farrowed in December should be sold as pork. If they are carried on to bacon weights, no milk will be available for the later litters, which will have to be sold cheaply as stores or wintered on expensive concentrates. Available root crops may be fed to sows, but they require supplementing with milk or meat meal.

Tuberculosis not only causes considerable loss in poultry, but it frequently spreads to pigs, with consequent condemnations at the meat works. If this disease is suspected, veterinary aid should be sought with a view to eliminating affected birds.

If rams remain with the ewes for more than 4 weeks, they should be raddled on the brisket so that the late-lambing ewes can be drafted off. Once the ewes are in lamb the level of feeding should be lowered to prevent their becoming too fat. If the rate of stocking is increased during autumn, some paddocks can be shut up and pasture allowed to grow for grazing during the 3 weeks before lambing. These measures will greatly assist in reducing "sleepy sickness", which is most prevalent in fat ewes which are inadequately fed just before lambing. Ewes which are well fed during the month before lambing produce on the average half a pound more wool per head than those which are underfed during this period.

If summer and autumn have been wet, lambs are likely to be suffering from worms. Drenching with phenothiazine 2 or 3 times at 3-weekly intervals will help. This applies particularly to the tail of the flock, which should be drafted off for special attention. Feed, however, is the most important consideration. During autumn lambs do best if grazed on pastures which have been allowed to grow to a height of 4in. to 6in. Hay aftermath and clover are very good. If these are not available, the lambs should be distributed thinly over the dairy paddocks or on hill pastures. They should on no account be concentrated in large numbers on short, rapidly growing pastures, especially if these have previously been grazed by ewes and lambs.

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the Register should be consulted and wherever possible a bull by a proven sire out of a merit cow should be selected. Bull catalogues are issued annually by the Herd Improvement Association and these, too, should prove of considerable value to dairy farmers who are looking for herd sires. The New Zealand Dairy Board is now developing artificial breeding on a commercial basis and farmers interested in making use of this service should get in touch with their local Herd Improvement Association.

The best way to prevent calves dying during winter is to treat them properly during autumn. They should never spend more than 2 or 3 days in one paddock, and should be rotated ahead of the cows through the best paddocks available. Good-quality hay should be provided for them daily, especially when the feed is growing fast after autumn rains. Set stocked calves should be drenched with phenothiazine as soon as scouring is noticed.



A dairy cow requires a reasonable spell between lactations, and should be dried off at least 6 weeks before she is due to calve. This should be done even if she is still milking heavily. The drying-off process need not be prolonged; it is quite safe just to stop milking, provided any quarters affected with mastitis are treated with the usual course of 3 tubes of penicillin, the last tube being given after the cow is milked for the last time.

Early-calving cows are nearly always short of feed during July and August, and often during September. In most seasons pasture is not growing fast enough during these months to meet the requirements of milking cows. Crops are expensive to grow and concentrates are even more expensive to buy. It costs nothing, however, to shut up pasture in the middle of April and let it grow for use in early spring. About a sixth of the dairy area should be shut up in this way. Advice regarding the best paddocks to spell and the best method of feeding the autumn-saved pasture by the use of electric fences can be obtained from local officers of the Department of Agriculture.

## Dairy Produce Graded for Export

**T**HE following figures showing quantities of dairy produce graded for export during January and for the 6 months ended 31 January 1954, with comparative figures for the same month and 6-monthly period of 1952-53, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

### BUTTER

| Period                  | Creamery | Tons<br>Whey | Total   | Percentage<br>Inc. or dec. |
|-------------------------|----------|--------------|---------|----------------------------|
| January 1954 .. ..      | 17,946   | 368          | 18,314  | —                          |
| January 1953 .. ..      | 21,205   | 415          | 21,620  | —                          |
| Increase or decrease .. | —3,259   | —47          | —3,306  | —15.291                    |
| 6 months ended 31/1/54  | 109,789  | 2,082        | 111,871 | —                          |
| 6 months ended 31/1/53  | 116,128  | 2,081        | 118,209 | —                          |
| Increase or decrease .. | —6,339   | —1           | —6,338  | —5.361                     |

Butter in store at 31 January 1954 was 29,198 tons

### CHEESE

| Period                  | White  | Tons<br>Coloured | Total  | Percentage<br>Inc. or dec. |
|-------------------------|--------|------------------|--------|----------------------------|
| January 1954 .. ..      | 12,623 | 39               | 12,662 | —                          |
| January 1953 .. ..      | 13,537 | 15               | 13,552 | —                          |
| Increase or decrease .. | —914   | —24              | —890   | —6.567                     |
| 6 months ended 31/1/54  | 64,951 | 98               | 65,049 | —                          |
| 6 months ended 31/1/53  | 65,941 | 79               | 66,020 | —                          |
| Increase or decrease .. | —990   | —19              | —1,009 | —1.476                     |

Cheese in store at 31 January 1954 was 18,976 tons

If these figures are converted into butterfat equivalent, there is a decrease of 4.579 per cent. in butterfat graded for the 6 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.



# Autumn Supplementary Feeding and Pasture Management

Seasonal Notes by the Extension Division

**D**URING the past few years an increasing number of dairy farmers have been ploughing up and resowing some of their poorer pastures. In many cases ploughing is done in early spring and the area is sown down in a crop to be fed off in the following autumn, after which the new grass is sown. Soft turnips are proving to be a very popular crop for this purpose, being easy to grow and requiring no special treatment of any sort. Perfect utilisation of the turnip crop can be obtained only by pulling the roots and feeding them out in another paddock. This is a time-consuming task not favoured by the average farmer, who is usually content to let his cows harvest the turnips for themselves. If this is done, the crop should be fed off in breaks with use of the electric fence and the cows given about 2 hours daily on the turnips, after which they are run on to a grass paddock. If they are allowed on the turnips all day, the milk or cream going to the factory will be tainted and graded down. Other popular autumn fodder crops are chou moellier and green maize; the former can be grazed in the same manner as the turnip crop, but the maize should be cut and fed out. One advantage in feeding off the autumn supplementary crop on the paddock is that the accumulation of stock droppings and decaying leaves on the area helps to provide a fertile seed-bed for the new grass. When autumn pasture is insufficient for the requirements of the herd and no supplementary fodder crops are available silage should be fed out. Although this will not hold the cows to their milk as well as turnips will, it will help them to produce reasonably well and will prevent the serious autumn drop in production characteristic of so many farms, particularly in a dry season.

## EARLY AUTUMN SUPPLEMENTARY FEEDING

**E**ARLY autumn supplementary feeding is essential if adequate provision of winter-saved grass is to be made. Feeding must start before grass growth goes off; that is, it must start before it is actually needed. Otherwise it is not practicable to save sufficient grass for feeding in early spring. The production of a herd largely depends on the way it has been wintered and on the way it is fed for the first 2 months after calving. In most of the dairying districts of the North Island the majority of cows calve in July and August before the spring grass growth starts to come away. It is thus essential that grass be grown over late autumn and early winter and saved up as autumn-saved pasture to be available for the herd to tide them through the period between calving and the beginning of spring growth. The area so saved varies greatly from farm to farm, but in general the tendency is to save too little, with the result that the area of autumn-saved pasture is consumed before spring growth is available. When this happens production may drop considerably and may never be completely regained. The area to be closed varies according to the size of the herd and the class of pasture. It is obvious that the poorer the pasture is the greater will be the area of winter-saved pasture needed. In most cases at least half the farm should be closed up, but not all at the one time. On the average farm about a tenth should be closed at the end of March or early April, another three-tenths about 2 weeks later, and a further tenth in early May. The herd is wintered on the rest of the farm, each paddock being stocked in turn. When each paddock has been well dunged it is harrowed

and closed up. If the earliest closed paddock gets too much growth on it, it can be lightly grazed by the whole herd. After calving the herd is break grazed on the autumn-saved pasture and also given silage and good hay. As spring growth begins so does the size of the daily break increase, until finally the daily diet is wholly composed of grass.

—A. V. ALLO

## WINTER-MADE GRASS UNDER IRRIGATION

**A** PRACTICE which has been adopted at the Department of Agriculture's Winchmore Irrigation Research Station, and one which has had a good deal of success, has been the saving of grass produced in autumn for use during winter and early spring. In the production of winter-saved grass time of closing from stock has been found important. If pastures are closed too early, growth may become very bulky, in which case reduction in the nutritive value of the herbage is likely to occur and there may also be some rotting of the grass during winter. Too late closing, on the other hand, will naturally result in insufficient bulk. At Winchmore closing areas about the middle of March has been found ideal if the growth is intended for feeding during May, June, or July. For feeding in August and September the closing date can be delayed until the beginning of April. Short-rotation ryegrass will grow at lower soil temperatures than will perennial ryegrass, and the former is therefore more suitable for the production of out-of-season grass. Nevertheless, if the fertility conditions are high enough, a dominant perennial ryegrass-white clover pasture will produce good winter-saved grass. Pastures should be irrigated when considered necessary throughout March and April. Experience at Winchmore has shown that breeding ewes will winter successfully if given 2 to 3 hours per day on winter-saved grass plus 1 bale of hay per 100 ewes. At this rate of feeding 1 acre of good winter-saved grass should last 200 ewes for approximately 6 days. For ewes being wintered on turnips a change to winter-saved grass about 10 days or so before lambing begins is a good practice, as is also lambing on to winter-saved grass, provided the growth is not too rank.

—G. K. McPHERSON

## LIMING IN SOUTHLAND

**T**WO of the basic requirements for Southland are satisfactory drainage and adequate applications of lime. Where virgin land is being developed the application of between 2 and 4 tons of carbonate of lime per acre is recommended, the heavier application being made on the more retentive clay soils and the lighter quantity on the more silty and alluvial soils. Half this total quantity of lime should be applied during the cultivation after the first ploughing and the balance before the pasture is sown down. To maintain pastures at a high production level topdressing with lime is necessary, but discretion must be exercised in the quantity applied and the frequency of application. From soil analysis results there appears to have been excessive quantities of lime used on some farms, and it is suggested that where farmers are in doubt soil analyses be made. The results of the analyses may be used as a basis for formulating a future liming programme. Generally, however, the application of  $\frac{1}{2}$  ton of carbonate of lime per acre every second season should maintain a reasonable lime content in soils of pasture paddocks where approximately 2 tons per acre have been applied during the cultivation period.

—W. FAITHFUL



# Development of Sand Dune Country

By B. A. J. SMITH, Fields Instructor,  
Department of Agriculture,  
Palmerston North

ON the west coast of the North Island between Paekakariki in the south and Patea in the north lies an area of 250,000 acres of sand dune country. Varying in depth from 1 mile to 12 miles, it contains sands ranging from the loose, shifting dunes on the foreshore to areas of consolidated, fertile flats lying between stabilised dunes. The condition of the flats depends on their previous vegetative cover and water-table; they may be little more than raw sand or they may be heavy, fertile flats with high organic matter content capable of development into country carrying high-class pasture.

AS yet only relatively small areas of sand country have been brought into full production. Production from sand country in its original state is practically negligible, areas being used almost solely for wintering dairy stock from the heavier country further inland. Cows are moved on to the areas immediately the season ends and are wintered until 2 or 3 weeks before calving.

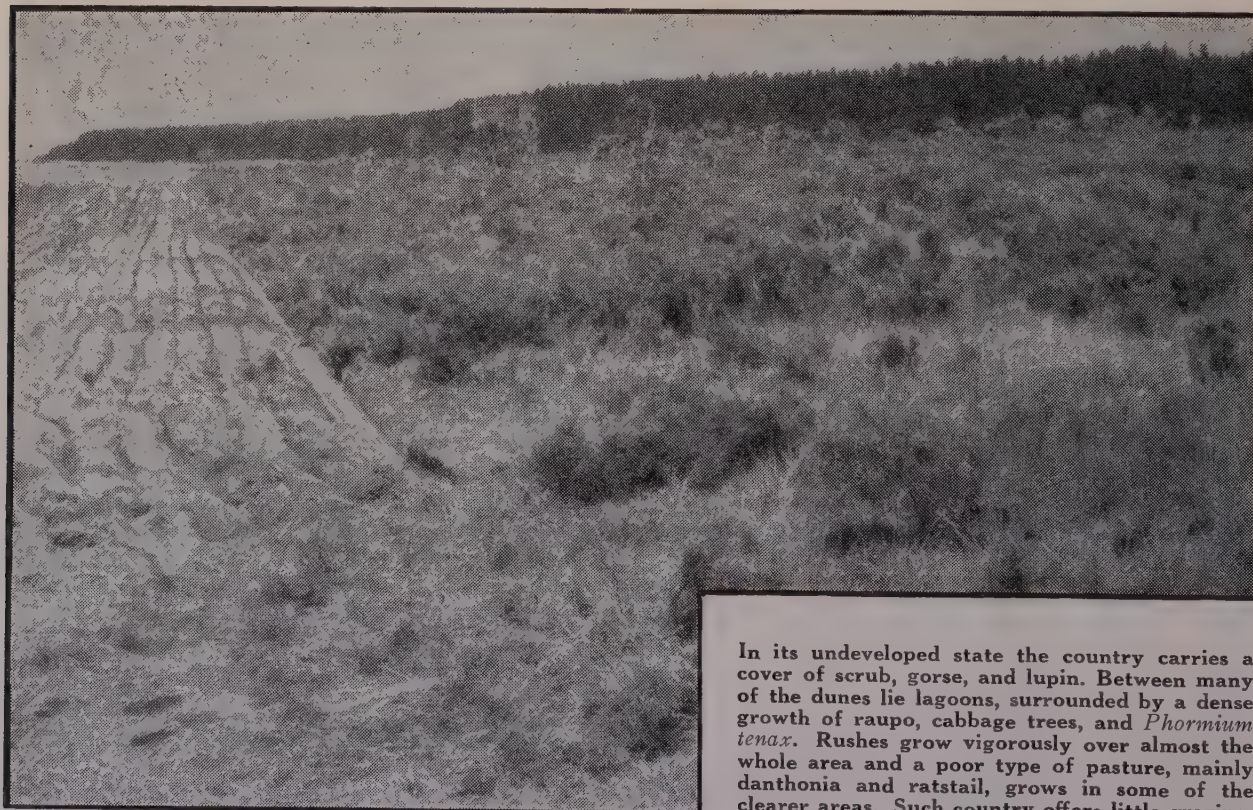
Under development according to the methods described sand country has been shown to be capable of quite high production, not only for dairy-



ing, but for fat lamb farming. A 250-acre farm on typical sand country developed in 1940, after being used as a winter run-off for a number of years, now carries 98 cows and replacement stock. In the 1952-53 season production reached 176lb. of butterfat per acre. On a similar area in 1935 a partly developed farm carried 600 sheep on 490 acres. In addition 45 dairy cows were wintered. Today, as a result of ploughing, regrassing, drainage, and adequate topdressing, the same farm carries 700 sheep and 100 dairy cows. The lambing percentage ranges from 95 to 104 per cent., with 80 per cent. of the lambs being fattened. The dairy production averages 168lb. of butterfat per acre.

The sand types vary from heavy wet flats to dry dunes within a short distance and the production is limited directly by these varying sand types. Provided that most of the farm is heavy sand flats, production can be increased to almost 200lb. of butterfat per acre under good management. If, however, the area contains too much light sand, it is necessary to make provision for the dry summer either by cropping or by having on hand adequate reserves of silage.

It is obvious, however, that the potential production of sand country is high and by use of modern development methods and good farming practices production on the area can be greatly increased.



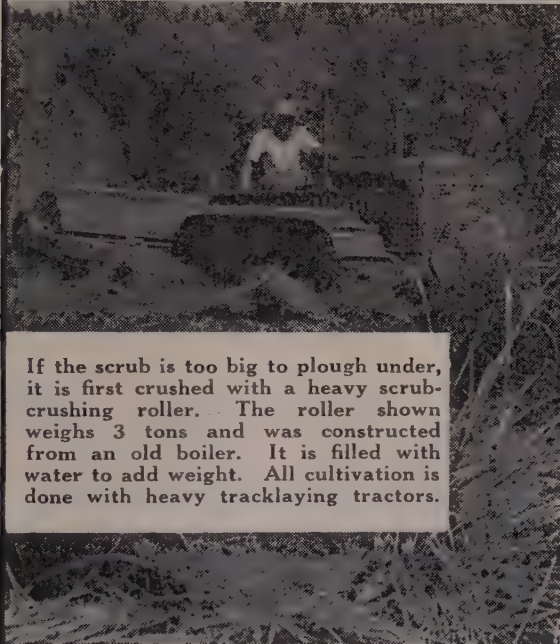
In its undeveloped state the country carries a cover of scrub, gorse, and lupin. Between many of the dunes lie lagoons, surrounded by a dense growth of raupo, cabbage trees, and *Phormium tenax*. Rushes grow vigorously over almost the whole area and a poor type of pasture, mainly danthonia and ratstail, grows in some of the clearer areas. Such country offers little grazing.



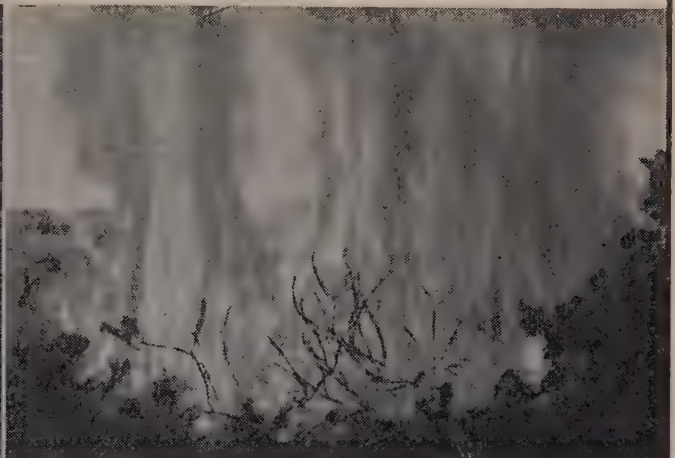
## Stages in Sand Country Development



Development has been confined to the better class of consolidated sand. Some clearing has been carried out by hand, but as this is both costly and arduous, modern mechanical methods are now used. Initial clearing is carried out by turning the standing scrub straight underneath with a heavy swamp plough turning a furrow 2ft. 6in. wide and 12in. to 14in. deep. Deep ploughing is necessary to uproot completely and turn under old gorse roots.

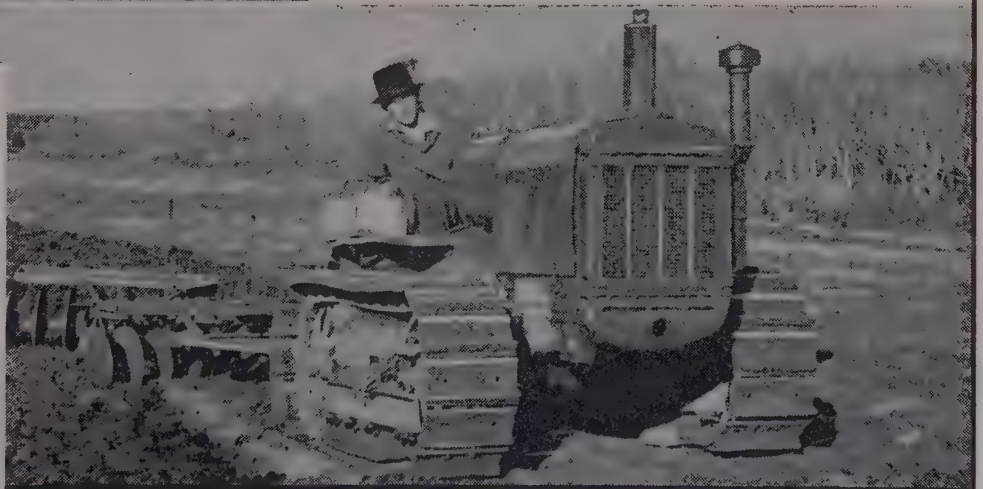


If the scrub is too big to plough under, it is first crushed with a heavy scrub-crushing roller. The roller shown weighs 3 tons and was constructed from an old boiler. It is filled with water to add weight. All cultivation is done with heavy tracklaying tractors.



Sometimes after being rolled and crushed the scrub may be fired to dispose of the bulk of the rubbish. This makes ploughing easier and leaves a more even surface for subsequent cultivation. Generally the aim is to get all the material turned under quickly, efficiently, and cheaply.

The furrows are consolidated straight after ploughing with the use of the same roller as for scrub crushing. Owing to the soil's sandy nature, little cultivation is required. Usually a stroke with disc harrows followed by a stroke with tine harrows is sufficient if the land is to be sown to a crop.





## Stages in Development

Left—Areas ploughed during winter and spring are often sown in turnips, rape, or lupin for fattening lambs. A dressing of 3cwt. per acre of phosphate should be applied with each crop. After crops are fed off autumn sowing is carried out, often by broadcasting the grass seed directly on to the rape stubble and trampling with a mob of sheep. On this type of country it is desirable to sow down, whether to a crop or to grass, as soon as possible after ploughing, since strong winds, frequent in this area, can remove large quantities of topsoil in a short time.

Right—If the area is going directly into grass after a summer ploughing, a little more cultivation is required than if it were going into crop. Generally a further tine harrowing and a rolling with the Cambridge roller are sufficient. The grass seed is broadcast, lightly harrowed with brush harrows, and rolled again. Adequate consolidation is extremely important on this country. It is wise to delay sowing until after the autumn rains begin. This gives time for good cultivation and allows seed to be properly covered.

Left—A seeds mixture which has given good results on the sand is as follows:—

|                                   | Lb. per<br>acre |
|-----------------------------------|-----------------|
| Certified short-rotation ryegrass | 12              |
| Certified perennial ryegrass      | 12              |
| Certified cocksfoot               | 8               |
| Certified white clover            | 3               |
| Certified red clover              | 2               |
| Subterranean clover               | 3               |
| <b>Total</b>                      | <b>40</b>       |

Isolated patches which lie damp or wet for a great part of the year can be oversown with strawberry clover. The illustration shows strawberry clover with white clover and ryegrass in a damp hollow. Strawberry clover can be included in mixtures if wet areas are extensive, it can be oversown, or it may be introduced in turves from an area where it is established.

Right—The type of development already described is confined to the ploughable flats which lie between stabilised dunes. The dunes themselves require somewhat different treatment, since the top surface cover should not be broken. If this occurs, wind blows develop and are usually difficult to repair. To overcome this danger it is desirable to maintain some cover on the dune at all times. The illustration shows a central stabilised dune which was lightly hand cleared of isolated gorse and lupin by firing and then oversown with a mixture of 10lb. of perennial ryegrass, 2lb. of subterranean clover, and 1lb. of white clover per acre. It was topdressed at the same time with 3cwt. of phosphate per acre. With careful management good pasture cover will soon develop.



## of Sand Country

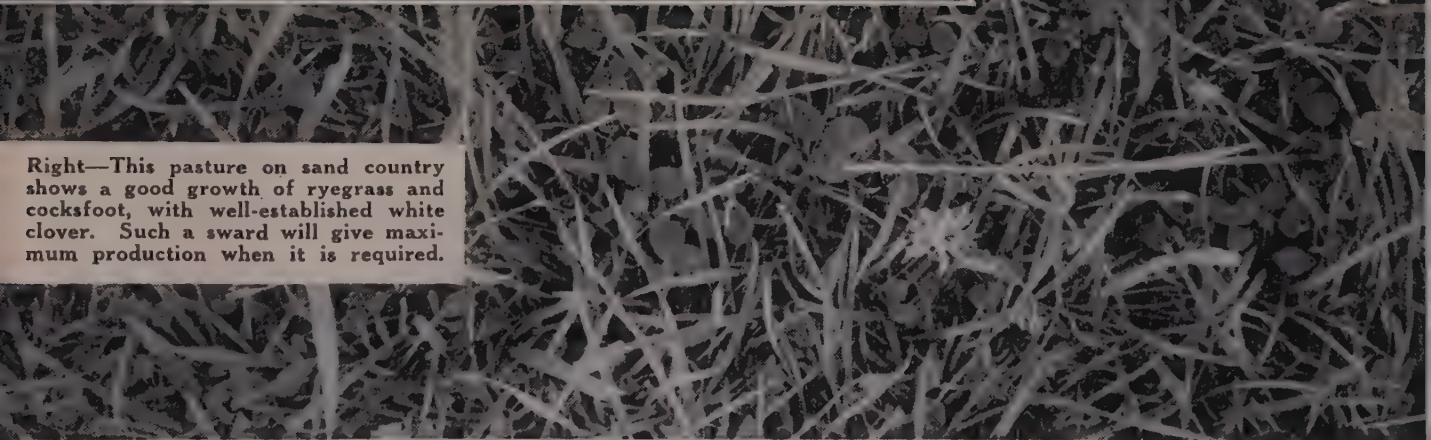
Right—During the formation of the dunes many wet flats have been formed and drainage of these is necessary before a good pasture can be established. Straight-sided drains are of little value, as stock break down the sides by trampling and drains become blocked. Sloping-sided V drains are therefore used. They are cut out before sowing down so that they can be grassed at the same time as the rest of the area. Their sloping sides allow easy passage of stock and implements and there is no danger of the sides falling in and blocking the drains.



Left—Management of pastures on sand country requires special attention. Grazing for the first few years should be lenient to allow the establishment and full development of all species. In the first summer, pastures should be allowed to grow long. This not only gives them a chance to establish, but shades and protects young clover seedlings. Some reseeding also takes place. Because sheep by their close grazing of the most palatable species cause a sward to open up, early grazings should be by young dairy stock.



Right—This pasture on sand country shows a good growth of ryegrass and cocksfoot, with well-established white clover. Such a sward will give maximum production when it is required.



Below—Light grazing only should be allowed in summer. Pastures then develop a tight sward that stands up to long dry spells. Heavy grazing means a loss of desirable pasture plants, the influx of weeds, and a general loss in production.





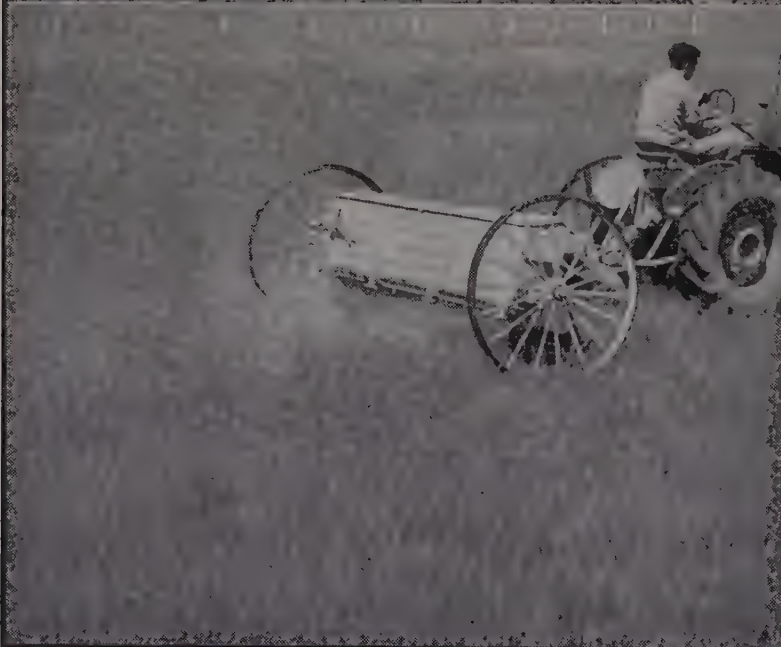
## Stages in Sand Country Development



Subdivision should aim at providing paddocks in which growth can be controlled at all times. The fencing off of ridges is usually necessary so that stock can be kept off them when required. Overstocking of the stabilised dunes leads to a rapid deterioration and opening up of the sward. Here is a ridge fenced off so that grazing on the area can be controlled.

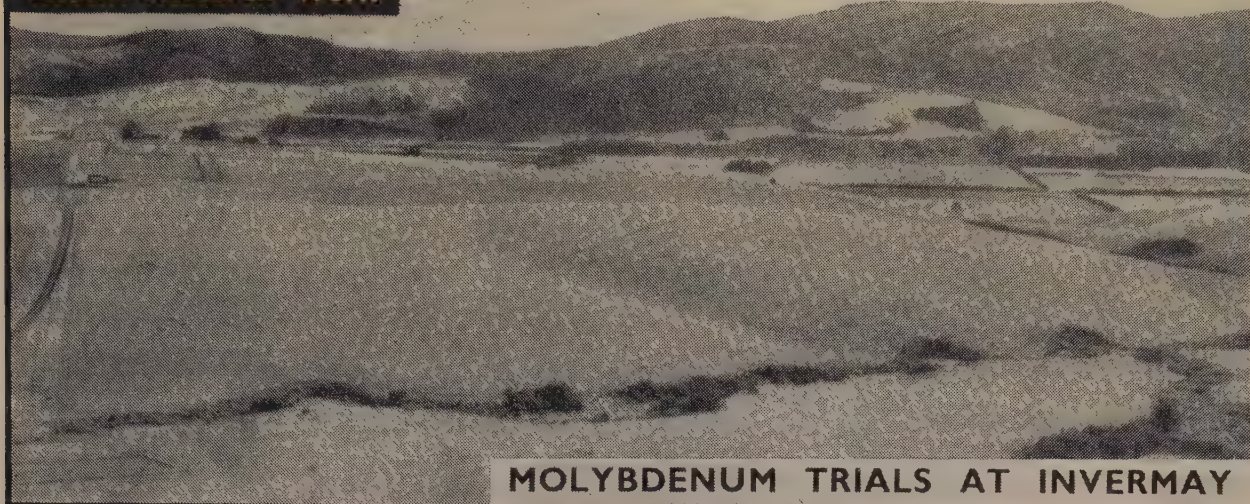


Shelter is important, not only because of its value to stock, but because strong winds will shift sand from any areas under cultivation or where the surface has been broken. This row of macrocarpas along the side of a grassed drain affords good protection from the strong prevailing westerly winds which are prevalent along this coast. Macrocarpas are also valuable because of their tolerance to salt spray.



Topdressing is essential for the maintenance of first-class pastures. At sowing down it is advisable to use 2 or 3cwt. of phosphate with a further similar dressing in the following spring to stimulate clover growth. Subsequent dressings of 2 to 3cwt. of phosphate should be carried out each year, preferably in autumn. Lime is not necessary on this type of country, but dressings of  $\frac{1}{2}$  to 1cwt. of potash often give good results when applied with phosphate. Here topdressing is being carried out on new grass in spring.





**MOLYBDENUM TRIALS AT INVERMAY**

**W**ITH the purpose of defining the extent of molybdenum deficiency in New Zealand the Extension Division of the Department of Agriculture has in operation some 400 trials, mainly of a simple observational type. Precise investigations involving replicated yield trials are of necessity restricted to experimental areas. For such work Invermay Research Station, Otago, is admirably suited, since the hill portion of the station is in a molybdenum-deficient area. After early success a wide programme of experimental work was planned at Invermay and is now in progress. Results from three such trials are given here. The trials were laid down in September 1952 to investigate the following aspects of use of molybdenum: The optimum rate of application, the best time of application, and lime, phosphate, and molybdenum interactions. The trials are situated on land that has received little, if any, topdressing since it was sown in pasture in 1945. The soil test when the trials were initiated showed moderate acidity (pH 5.7) and a low phosphate level.

## RATES OF MOLYBDENUM

**EIGHT** rates of sodium molybdate (nil, 1/16oz., 1/8oz., 1/4oz., 1/2oz., 1oz., 2oz., and 4oz. per acre) were included in this trial, 5 plots of each rate being pegged out in a random layout. All plots received a basal dressing of 2cwt. of reverted superphosphate, 1/2 ton of lime, and 1cwt. of muriate of potash and were oversown with 3lb. of Montgomery red clover and 3lb. of New Zealand Certified white clover. The responses to molybdenum applications have been measured by mowing and weighing the herbage and results from November 1952 to May 1953 show:—

1. Responses to all the molybdenum applications from 1/16oz. to 4oz. per acre were quickly noted and evident in the later mowing cuts.
2. Large increases in the weight of the herbage produced were recorded with the heavier application rates, the magnitude of response varying with the rate of application up to the 1oz. dressing; 4oz. proved no better than 1oz. or 2oz.
3. For the 1952-53 season the 1oz. and 2oz. rates gave a total of about 6300lb. of dry matter per acre compared with 4800lb. of dry matter from the control (no molybdenum) plots, an increase of 1500lb. of dry matter, or about 30 per cent.
4. Clover density, vigour, and colour improved noticeably in the molybdenum-treated plots and by the end of the season these plots showed up to 50 per cent. of clovers compared with less than 10 per cent. on the untreated plots.
5. At the last cut in April 1/16oz. per acre gave approximately a 50 per cent. increase and 1oz. per acre 100 per cent. increase in dry matter produced per acre.

## TIME OF APPLICATION OF MOLYBDENUM

Plots were laid down during September, November, January, and March to investigate the effect of time of application on molybdenum

response.

1. Results to date indicate that responses to molybdenum

can be expected from applications made at any season of the year.

2. September and November applications by the end of the season showed increases of more than 100 per cent. in the dry matter weight of herbage produced. This was predominantly clover growth, which was very dense and vigorous in the molybdenum-treated plots.

## MOLYBDENUM, LIME, AND PHOSPHATE INTERACTIONS

In this trial the following treatments were applied: 2 tons of lime per acre, 5cwt. of lime per acre, 5cwt. of lime and 2 1/2oz. of sodium molybdate, and 2 tons of lime and 2 1/2oz. of sodium molybdate per acre. In addition various phosphates (North African, fine Nauru, and Christmas Island ground rock phosphates and superphosphate) were used at 3cwt. per acre. A control (no phosphate) plot also was included.

1. The heavy liming (2 tons per acre) has not resulted in increased production in the absence of molybdenum, but has increased the production slightly in the molybdenum-treated plots.

2. The response to superphosphate has been very marked in the molybdenum-treated plots, but very poor in the plots treated with lime only. In the 2 tons of lime + 2 1/2oz. of sodium molybdate plots the superphosphate plots yielded some 20 per cent. more than the control and rock phosphate treatments. In this series the superphosphate plots produced over 5000lb. of dry matter per acre for the season compared with about 4000lb. in the control and rock phosphate plots. In the 5cwt. of lime-no molybdenum series all treatments, including superphosphate, yielded only about 3400lb. of dry matter. In the 2 tons of lime-no molybdenum plots the superphosphate plots gave a slight increase, but the rock phosphate treatments showed a decrease.

3. It is evident from these results that to date yields from the rock phosphate treatments are very poor, being only comparable with the control (no phosphate) plots and markedly inferior to superphosphate in the molybdenum-treated plots.

4. As with other trials on this area the molybdenum-treated plots show a clover content of about 50 per cent. compared with less than 10 per cent. on the untreated plots.

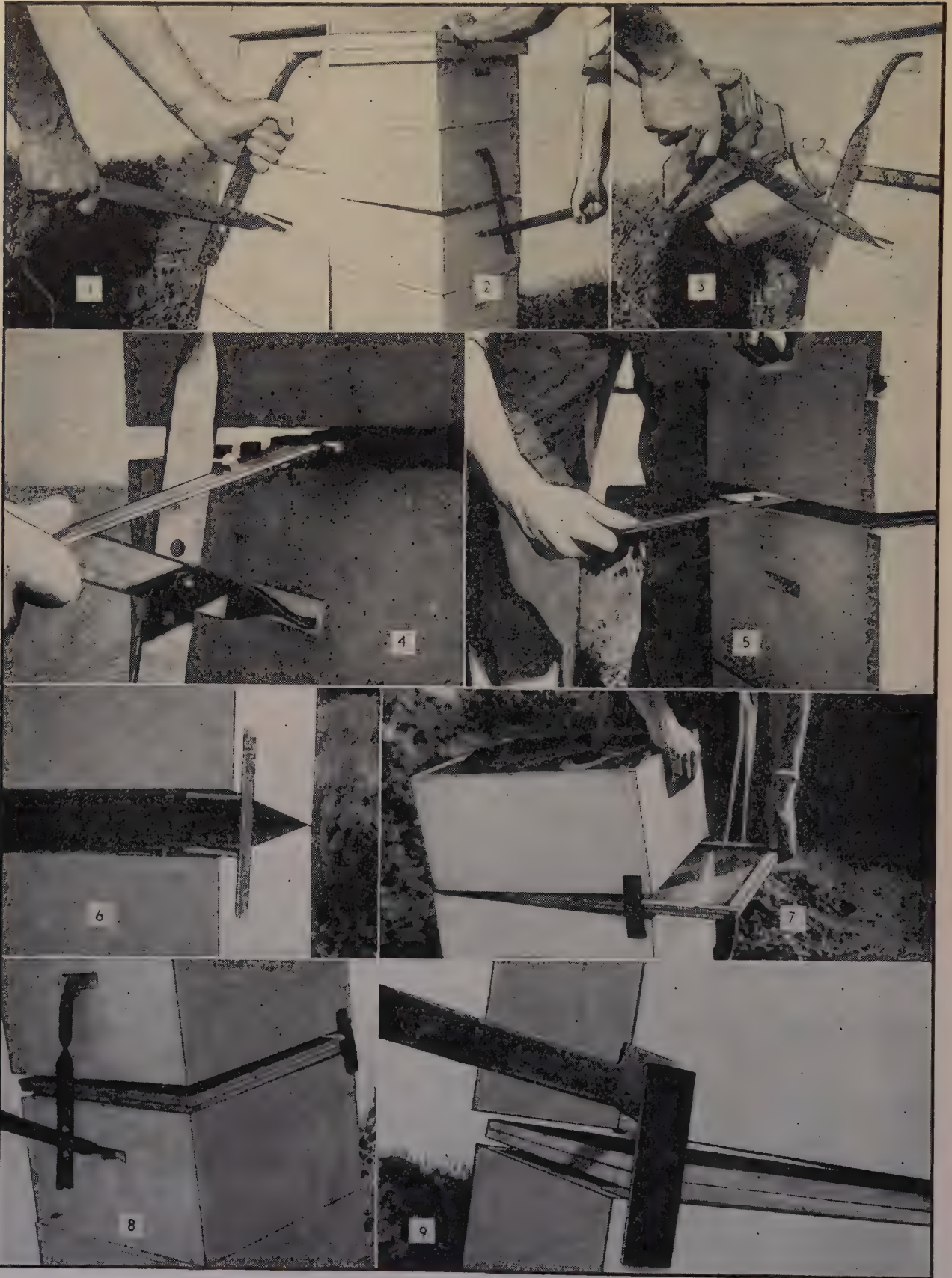
## CONCLUSION

In these trials minute quantities of sodium molybdate (1oz. to 2oz. per acre) applied with 3cwt. of superphosphate effected a spectacular improvement on run-out, browntop-dominant hill pasture. In these trials oversowing with clovers was carried out and this practice is recommended where topdressing with lime, phosphates, and molybdenum is contemplated on run-out swards almost entirely deficient in clovers.

—N. A. CULLEN

**HEADING PHOTOGRAPH:** Country at Invermay typical of that where molybdenum responses have been secured.







# Equipment for Manipulation of Beehives

**M**ANIPULATION of beehives imposes considerable physical strain on the operator. The supers of combs, as well as being heavy, are usually stuck together with bee glue and wax, which at times makes the work most difficult. In this article I. W. Forster, Apiary Instructor, Department of Agriculture, Oamaru, describes some appliances which can be used to facilitate some phases of hive manipulation.

**T**HOUGH to the uninitiated the removal of supers from a hive may appear to be simple and straightforward, it can be quite difficult.

A full super of honey will weigh some 80lb. and is often firmly fastened down by wax built from the bottom of the combs on to the top bars of those in the box below. Also the boxes themselves may be firmly glued together with propolis, which is a sticky material that bees gather from the buds of certain trees and use for blocking chinks, varnishing surfaces, and sticking the component parts of the hive together. To avoid angering or killing the bees in the hive the boxes should be broken apart with as little jarring as possible and lifted straight up in preference to being slewed or twisted.

## The Hive Tool

A good hive tool is an essential part of a beekeeper's equipment and the use of such a type as the one illustrated will greatly facilitate the ordinary manipulation of frames and boxes.

A hive tool should be made of stout metal, and spring steel about  $\frac{1}{8}$  in. thick is recommended. The spur A is for thrusting under the end lug of the frame and levering upward. The shoulder B rests on the top bar of the adjacent frame and acts as a fulcrum. This upward pressure should not be applied with too much force until the frames have been otherwise loosened or the top bar may be prised from the frame. This loosening is best done by moving the frames sideways with the square lug C. This projection is inserted between the frames, with the hive tool held parallel to the top bars; the tool is then twisted toward the right angle position to force the frames



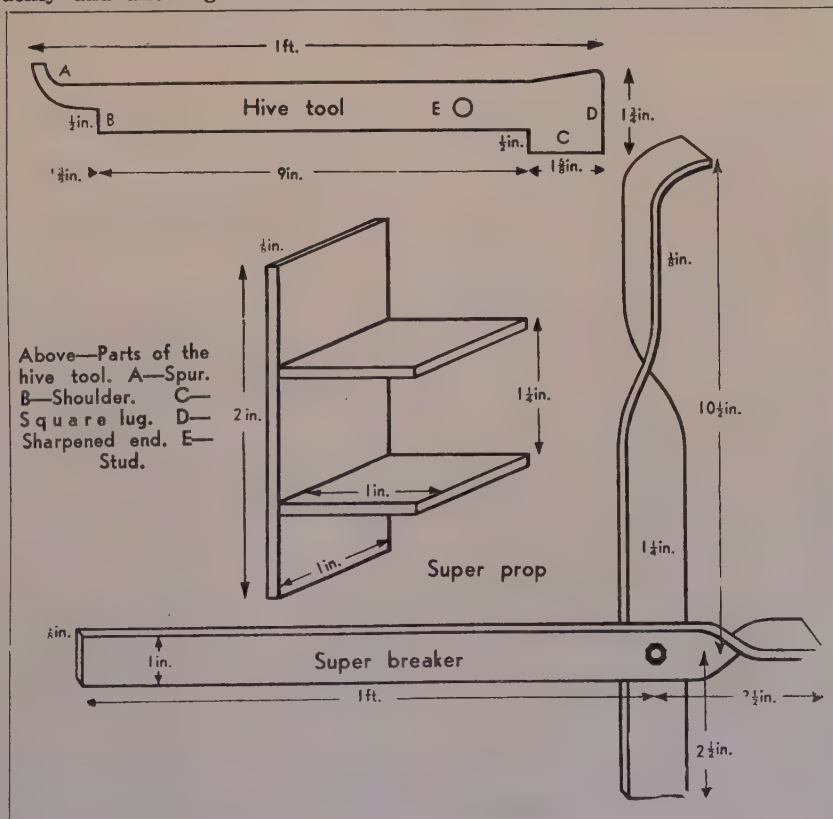
Uses of the hive tool. Upper—Parting supers with the hive tool. Note the stud for protecting the thumb. Lower—Parting frames with a hive tool lug.

apart. The end D' is sharpened for prising boxes apart. It is important that a clean, sharp edge be maintained, as any burring greatly reduces the effectiveness of the tool.

Most beekeepers have had the experience of two boxes parting suddenly and allowing the hive tool to

jerk into the gap and bring their thumb into violent contact with the super. To reduce the risk of this a stud E is put through the hive tool, projecting  $\frac{1}{4}$  in. on either side.

The difficulty of parting hive bodies with a hive tool is that the full weight must be taken on the fingers of the



Illustrations opposite: Equipment for easy manipulation of hives. 1—The super breaker in position for parting two supers. 2—Breaking the two supers. 3—The supers are parted and smoke is applied. 4—When a very obstinate frame has to be prised down with the hive tool the super can be supported with the super breaker, or, 5, it can be supported with the fingers of one hand. 6—The super prop in position. 7—A bee escape half inserted through the props. 8—The other end of the super is lifted and the escape is pushed into position. 9—Removing super prop with hive tool.



left hand while the super is prised up and in many cases held while the frames in the bottom box are levered from those above. It is also necessary to apply some smoke between the boxes, which further increases the time the super must be held in the raised position.

### The Super Breaker

The super breaker illustrated on page 242 can be easily made from lin. x  $\frac{1}{4}$  in. mild or spring steel. (In the implement illustrated the lever is spring steel and the lifting arm is a piece of ordinary fencing standard.)

The two right-angled twists can be easily made by placing the metal in a vice, heating it with a welding torch, and then twisting it with a pair of pipe tongs. The pivot is a  $\frac{1}{4}$  in. bolt.

The super breaker obtains purchase from the hand holds. These must have a right-angled lower lip as in standard equipment. Boxes need to be fairly uniform to give a consistent spacing of hand holds, though the breaker will work within a reasonable tolerance.

The breaker is best operated in the manner illustrated by placing the short end of the lever in the lower hand hold and the lifting arm in the upper hand hold. The lifting of the handle then thrusts the top super upward. If used in reverse, with the lifting arm in the lower hand hold acting as a fulcrum for the lever, which is applied to the upper hand hold, the device is not nearly so effective.

Two hands may be necessary to make the initial thrust, but one hand can easily continue the lift, leaving the other free to wield the smoker or the hive tool should a particularly obstinate frame need prising down. It is seldom necessary to use the hive tool for this purpose, as when raised to its full extent the breaker usually parts the two sets of frames with no difficulty.

As the leverage obtained by the super breaker allows three supers to be lifted if required, it is possible and usually convenient to break all joints in the hive at the first operation while the operator has the implement in his hand. This also allows a little smoke to be blown between each box and the entire colony brought under control.

### Super Props

Two super props can be conveniently used in conjunction with the super breaker to save the complete removal of supers when screens, bee escapes, or queen excluders are being inserted or withdrawn.

Each prop is a short piece of lin. x  $\frac{1}{4}$  in. mild steel with two ledges of similar material welded on at right angles.

One end of the super or supers is raised with the breaker and a prop is placed under each corner. The other end is then raised and the screen, escape, or excluder inserted or withdrawn as required. The props can then be prised out with the hive tool.

These appliances can be cheaply and easily constructed, and though simple and elementary in operation, they greatly facilitate hive manipulation.

**R**ADIO broadcasts to farmers are made at the following times:—

#### IYA Auckland, 7.15 p.m.

7 April—"Storing Vegetables for Winter and Spring Use", by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

14 April—"Autumn and Winter Pasture Management", by R. B. Bakewell, Fields Instructor, Department of Agriculture, Pukekohe.

21 April—"The Language of the Bees", by D. Roberts, Apiary Instructor, Department of Agriculture, Auckland.

28 April—Y.F.C. talk, by the Dominion president, New Zealand Federation of Young Farmers' Clubs.

#### IXH Hamilton, 12.33 p.m.

1 April—"Winter Management of the Dairy Cow", by V. E. Senior, Veterinarian, Department of Agriculture, Hamilton.

8 April—"Problems of the Month", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

15 April—"Meat and Wool Outlook for 1954", by A. B. Baker, Federated Farmers, Hamilton.

22 April—"Off-season Improvements in and around the Milking Shed", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

29 April—"Making Household Poultry Pay", by W. L. Jourdain, Poultry Instructor, Department of Agriculture, Hamilton.

#### IYZ Rotorua, 7.15 p.m.

1 April—"Off-season Improvements in and around the Milking Shed", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

15 April—"Hogget Diseases and their Treatment", by V. E. Senior, Veterinarian, Department of Agriculture, Hamilton.

29 April—"Methods of Increasing Production", by P. A. Dunne, Fields Instructor, Department of Agriculture, Matamata.

#### 2YZ Napier, 7.10 p.m.

27 April—"Pastures and Their Management", by S. H. Henry, Instructor in Agriculture, Department of Agriculture, Hastings.

#### Regular Sessions

1XH Hamilton, Mondays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m., Tuesdays (fortnightly) at 8 p.m., Wednesdays at 8.5 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

## Meteorological Records for January

| Station               | Height of station<br>above M.S.L. (ft.) | Air temperatures in<br>degrees (Fahrenheit) |                           |                                       |         | Rainfall in inches |                        |                           |                 |      |       | Bright sunshine<br>hours |
|-----------------------|-----------------------------------------|---------------------------------------------|---------------------------|---------------------------------------|---------|--------------------|------------------------|---------------------------|-----------------|------|-------|--------------------------|
|                       |                                         | Approx. mean                                | Difference<br>from normal | Absolute<br>maximum<br>and<br>minimum |         | Total<br>fall      | No. of days<br>of rain | Difference<br>from normal | Maximum<br>fall |      |       |                          |
|                       |                                         |                                             |                           | Maximum                               | Minimum |                    |                        |                           | Amount          | Date |       |                          |
| Kerikeri              | 201                                     | 67.6                                        | + 2.7                     | 85.9                                  | 46.8    | 0.96               | 6                      | — 3.54                    | 0.56            | 6    | 212.6 |                          |
| Auckland              | 160                                     | 68.0                                        | + 1.6                     | 83.6                                  | 56.9    | 0.36               | 5                      | — 2.82                    | 0.18            | 15   | 208.4 |                          |
| Tauranga              | 10                                      | 66.4                                        | + 1.8                     | 83.6                                  | 46.2    | 0.64               | 7                      | — 3.30                    | 0.26            | 15   | 251.0 |                          |
| Ruakura               | 131                                     | 64.3                                        | + 2.2                     | 84.0                                  | 42.7    | 1.00               | 6                      | — 2.48                    | 0.44            | 23   | 229.6 |                          |
| Rotorua               | 975                                     | 65.2                                        | + 2.4                     | 86.9                                  | 44.2    | 1.24               | 9                      | — 3.12                    | 0.28            | 15   | 226.6 |                          |
| Gisborne              | 12                                      | 64.8                                        | + 0.0                     | 90.4                                  | 43.7    | 1.52               | 7                      | — 1.02                    | 1.11            | 20   | 262.0 |                          |
| New Plymouth          | 160                                     | 62.8                                        | + 0.6                     | 77.2                                  | 48.0    | 1.77               | 4                      | — 2.70                    | 1.04            | 6    | 282.2 |                          |
| Karioi                | 2125                                    | 59.6                                        | + 2.6                     | 81.0                                  | 36.5    | 0.84               | 4                      | — 2.84                    | 0.39            | 6    |       |                          |
| Napier                | 5                                       | 65.4                                        | - 0.1                     | 91.0                                  | 44.8    | 0.23               | 3                      | — 2.38                    | 0.16            | 10   | 254.6 |                          |
| Wanganui              | 72                                      | 64.9                                        | + 1.4                     | 82.8                                  | 44.9    | 0.94               | 5                      | — 1.84                    | 0.49            | 6    | 289.3 |                          |
| Palmerston North      | 110                                     | 62.6                                        | + 0.2                     | 80.4                                  | 45.8    | 1.52               | 5                      | — 1.68                    | 0.94            | 10   | 255.6 |                          |
| Waingawa              | 340                                     | 62.8                                        | + 0.4                     | 87.0                                  | 37.0    | 0.76               | 8                      | — 1.64                    | 0.35            | 6    | 268.5 |                          |
| Kelburn               | 415                                     | 61.6                                        | + 0.6                     | 78.8                                  | 45.5    | 1.61               | 4                      | — 1.47                    | 1.17            | 10   | 287.2 |                          |
| Nelson airfield       | 5                                       | 62.4                                        | + 0.8                     | 81.8                                  | 42.7    | 1.39               | 4                      | — 1.45                    | 0.71            | 10   | 279.6 |                          |
| Blenheim              | 12                                      | 62.4                                        | - 0.2                     | 81.5                                  | 43.3    | 0.42               | 4                      | — 1.57                    | 0.24            | 10   | 270.3 |                          |
| Hokitika              | 15                                      | 57.6                                        | - 0.5                     | 73.7                                  | 45.1    | 6.62               | 11                     | — 3.10                    | 1.85            | 5    | 258.5 |                          |
| Hanmer                | 1270                                    | 60.4                                        | + 2.7                     | 88.0                                  | 35.0    | 1.35               | 9                      | — 2.18                    | 0.52            | 10   | 254.0 |                          |
| Christchurch          | 22                                      | 61.6                                        | + 0.2                     | 83.4                                  | 43.3    | 0.25               | 4                      | — 1.98                    | 0.15            | 12   | 223.5 |                          |
| Ashburton             | 323                                     | 62.2                                        | + 1.2                     | 93.0                                  | 40.6    | 1.06               | 8                      | — 1.63                    | 0.24            | 6    | 224.1 |                          |
| Timaru                | 56                                      | 60.6                                        | + 0.0                     | 79.2                                  | 40.8    | 0.97               | 7                      | — 1.40                    | 0.55            | 6    | 212.8 |                          |
| Alexandra             | 520                                     | 63.2                                        | + 1.5                     | 93.0                                  | 36.1    | 0.93               | 6                      | — 0.91                    | 0.66            | 5    | 267.0 |                          |
| Taieri                | 80                                      | 57.6                                        | - 0.2                     | 82.6                                  | 37.5    | 1.41               | 11                     | — 0.97                    | 0.57            | 10   | 204.4 |                          |
| Invercargill airfield | 0                                       | 54.6                                        | - 1.6                     | 74.5                                  | 32.9    | 2.51               | 15                     | — 1.22                    | 0.64            | 2    | 194.8 |                          |



# FARMING IN NEW ZEALAND

## Clutha County

**T**HE soils and main farming trends of the Catlins region and the tussock grasslands region are described in this second and concluding part of an article on farming development in Clutha County by J. G. Richards, Instructor in Agriculture, Department of Agriculture, Balclutha, and A. H. Mouat, Farm Economist, Department of Agriculture, Dunedin. In last month's "Journal" the history, soils, and topography of Clutha County generally and the soils and farming development of the downlands region were described.

### Kaihiku-Kaiwera Tussock Grasslands

The region of the tussock grasslands (Kaihiku-Kaiwera hill soils) runs from the Kaihiku Ranges south and east to the forested hills of the Catlins district. The average annual rainfall ranges from about 35in. to 45in. Most of the soils are developed on greywackes and are well drained. On the steeper slopes they are often shallow. The topography consists of long moderately steep ridges and easy rolling valleys. The native vegetation was fescue and silver tussock on the warmer, drier Kaihiku Ranges and red tussock in the valleys and hills to the south.

#### Soils

Three soils are recognised:—

**Kaihiku hill soils** are found on the moderately steep unploughable slopes of the Kaihiku Ranges. They were originally under fescue and silver tussock grasslands, but in places this has been invaded by bracken. They have grey silt loam topsoils. There is often rock in the profile. They are of moderate natural fertility.

**Kaiwera soils** occur on the rolling valleys south of the Kaihiku Ranges. They have a dark-grey crumbly silt loam topsoil and a brownish soft crumbly heavy silt loam subsoil. They are well drained but of a low natural fertility. They do not dry out in summer as do the soils of the lower-rainfall areas north of the Kaihiku Ranges.

**Kaiwera hill soils** occur on the red tussock-covered hills of this region where rainfall is over 35in. They are mostly stony and of low natural fertility.

#### Farming

South of Clinton through the Kuriwao Gorge lie the tussock hills and valleys of the Kaihiku-Kaiwera soil series. The region is bounded to the north by the high Kaihiku Ranges, in the south-west by the Slopedown Range, and in the south-east by the bush-clad Catlins area. The valley soils cover some 50,000 acres, the greater part of which is ploughable. Some of this land is being well improved by ploughing, draining, application of lime and fertiliser, and

sowing down to good pasture. The surrounding hill soils occupy a further 100,000 acres suitable for grazing.

Apart from a number of small farms in the more accessible valleys of better soils, most of the holdings in this region are large. Grazing runs average about 5000 acres and range from 2000 acres to 10,000 acres. The income on these grazing runs is derived from the sale of wool, cast-for-age ewes, cattle, and some store lambs. From development already undertaken it is quite evident that much of the ploughable tussock land can be improved to a carrying capacity which approaches that of the downlands region.

#### Pasture Establishment and Management

In this area there is a real effort to establish first-class pasture and by the use of heavy machinery much of the once unploughable tussock land is being developed. The tracklaying tractor, the giant discs, and the swamp plough have brought such development and improvement.

**HEADING PHOTOGRAPH:** A valley in the Catlins region, showing remnants of native bush, cleared farmland in the valley, and on the hillsides some areas which have reverted to scrub. The production of fat lambs, wool, and beef cattle is important in this region.



## THE CATLINS REGION



Upper left—Native bush near the coast. Upper right—The milling of timber from the dense bush opened up the region for settlers. This old mill illustrates the pioneering nature of the industry, which contributed greatly to the establishment of farms, roads, and railways in the region. At left—The pioneering appearance of the country. Areas of native bush and cleared land with scattered fields of sown pasture are typical of this country of valleys and hills. Lower left—Crops of mangolds and potatoes on land recently cleared of dense bush. The isolation of crops, the virgin soil, and the coastal location make the region suitable for the production of virus-free seed potatoes. Below—Beef cattle are a profitable means of controlling pastures and second growth of fern on bush clearings.





In the conversion of the tussock land to English grass and clover pasture the first essential, even on these fairly well-drained soils, is again early ploughing. Here the swamp plough, which is capable of turning an 8 to 10in. deep furrow 18 to 20in. wide, is almost invariably used for the first ploughing, preferably in January and February. The fallow over autumn and winter allows good weathering and rotting of vegetation, and with the application of 20 to 30cwt. of lime per acre during working in September-October a good seed-bed is obtained for the swede crop, which is the first one in the rotation. After the feeding of the swedes ground preparation is necessary to obtain the fine, firm, and weed-free seed-bed so essential for pasture establishment. Here, as in development of browntop land, a further ton of lime per acre is applied before sowing out to pasture. A pasture seeds mixture at per acre rates suitable to the area is:—

|                            | lb.      |
|----------------------------|----------|
| Perennial ryegrass .. ..   | 20       |
| Short-rotation ryegrass .. | 10       |
| Cocksfoot .. .. .          | 8        |
| Timothy .. .. .            | 4        |
| Montgomery red clover ..   | 3        |
| White clover .. .. .       | 3        |
|                            | <hr/> 48 |

### Catlins Bush

The region of the Catlins bush soils covers the remainder of Clutha County from Kaka Point to Chaslands Mistake and inland to the Kaihiku-Kaiwera Ranges. Rainfall is from 35in. to over 50in. per annum. Most of the district was forested when settlement began, but many of the valleys have been cleared and are now farmed. The topography resembles that of the Kaihiku-Kaiwera Ranges, but the proportion of rolling land is smaller.

### Soils

The wide range of soils in this region is due largely to the many



On the sheep runs of the tussock grasslands region beef cattle are useful in controlling roughage and swamp vegetation. Considerable areas of ploughable land are now being sown to good pastures. Lime, fertilisers, and drainage are important in this development.



The clearing of native bush for farmland has always been a problem in the Catlins region. The practice has been to cut the bush and burn it off. A good burn leaves the land clear for oversowing of seeds and grazing with sheep and cattle. A poor burn as shown on the left and in the centre of this photograph results in vigorous second growth of the bush.

different types of forest vegetation. The soils are best considered as:—

**Soils of the rolling valleys,** developed under a mixed forest of totara, matai, kahikatea, and associated broadleaf species. Included here are several soils distributed in a complex pattern corresponding with the original vegetative pattern. The soils of Glenomaru and Owaka Valleys, of moderate natural fertility, well-drained, and free working, are the most extensive and representative. The soils of the Tahakopa Valley farther south are more leached.

**Hill soils** are still largely under forest, but the millable timber has been removed. The rimu, kamahi, rata, and beech have encouraged intense leaching of plant foods and the soils are podzolised to varying degrees. Small areas of less leached soil are found where matai, totara, and broadleaf species dominated the forest. These hill soils are not suitable for agriculture and should remain under native forest.

### Farming

The Catlins region possesses the greatest variety of farming in South Otago and comprises over 200,000 acres or one-third of Clutha County. From the early years of first settlement timber has been a valuable product of this area. As the native bush was cut over for milling timber, roads were constructed up the valleys into the bush. Small patches were cleared for farms which slowly grew in size





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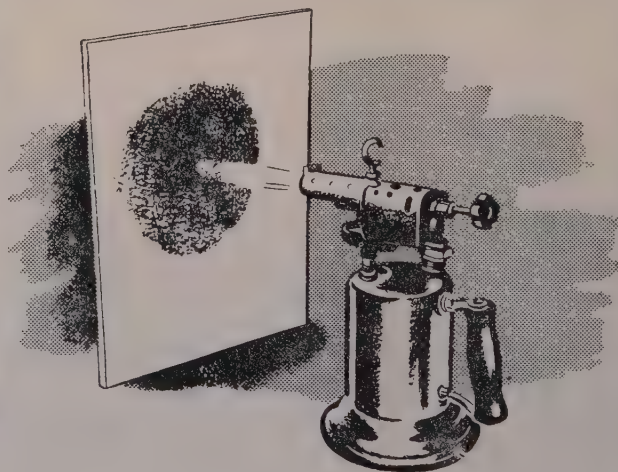
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as this laborious work continued. The native bush, by reason of the large variety of species, contributed greatly to the distinctive soil types present in this region today. Where matai and totara predominated the soils are now more fertile and kindly to work than in areas where trees such as kamahi produced acidic litter on the ground. Most of the farm land is in the valleys.

Dairy cows were run on the small farms cleared of bush and oversown with pasture seeds on the ashes after the bushburn. The region of equable climate and evenly distributed rainfall was established as a dairying district. Second growth of undesirable species presented a problem on the cleared areas. Without good and careful management the young growth of fuchsia, wineberry, bracken fern, bidi-bidi, and manuka took hold. The use of beef cattle was found to give some measure of control both by grazing and trampling this young growth, and some excellent lines of store cattle and some fat cattle are now marketed from this region.

As larger areas of bush were cleared for pastures on some farms dairying was gradually replaced by sheep farming. Over the past 15 years dairying has declined and breeding ewes have increased. On these sheep farms beef cattle are required to control the second growth and to improve the grazing for sheep. In this region sheep management centres around the production of fat lambs and wool. Romney ewes or Romney cross ewes are used throughout the region; these are mated to Southdown rams for fat lamb production or Romney rams for flock replacement purposes. The valleys of this region have now established a name for fat lamb production and the earliest lambs killed at the Finegand Freezing Works are from this district. A number of small flocks are run with dairy herds partly in an attempt to control ragwort.

Good pastures of ryegrass and white clover are again the basis of successful farming in this region. Drainage and the application of lime and fertiliser are necessary to achieve good pastures. Ragwort is a problem, not so much because of stock mortality as because it complicates farming practices in a district that is suitable dairying and cattle country. The introduction of sheep to control ragwort limits the use of this land for dairying.

### Pastures

Pastures are sown down with perennial ryegrass and white clover as basic constituents. Over the past few years, however, short-rotation ryegrass has proved valuable in the pasture and is now being included in most mixtures sown in the area. The percentage of this seed in the mixtures is also increasing; for example, where  $\frac{1}{2}$  bushel to the acre was previously sown 1 bushel may now be included. Short-rotation ryegrass requires adequate moisture to give best results and rainfall in Owaka area is adequate.

A Certified seeds mixture per acre is as follows:—

|                            | lb. |
|----------------------------|-----|
| Perennial ryegrass .. ..   | 20  |
| Short-rotation ryegrass .. | 15  |
| Cocksfoot .. ..            | 8   |
| Timothy .. ..              | 5   |
| White clover .. ..         | 3   |
| Cowgrass .. ..             | 2   |
| Montgomery red clover ..   | 2   |

55



A crop of young chou moellier in the Catlins region. Piecemeal clearing of the bush followed by inadequate management of the land has allowed the ingress of noxious weeds, including ragwort.

The soils of the rolling valleys respond to applications of lime. The practice of topdressing pastures with lime and phosphate has done much to increase the productivity of the area and the initial lime requirement of these soils is in general from 2½ to 3 tons per acre. With the assistance of the bulldozer and tractor to provide access to the hill country much of the unploughable land has received lime and phosphate.

In the valleys and on the easy rolling country subsequent treatment with lime and fertilisers is necessary for permanent production. There applications of superphosphate at up to 2½ cwt. per acre annually are a necessity and carbonate of lime is applied at  $\frac{1}{2}$  ton per acre, generally in the form of 1 ton every second year.

### Farming Possibilities of Clutha County

At the beginning of this article mention was made of some 189,000 acres of occupied unimproved land, and it is from development of this land that the greatest increase in production from Clutha County will come.

Many factors will operate to bring about the efficient land utilisation of the area, including the greater use of machinery, subdivision, provision of shelter, and the use of high-quality pasture and crop species.

The downlands region offers great scope in the regrassing to high-producing swards of much of the run-out and browntop dominant swards. Drainage, both tile and mole, and the use of adequate lime and phosphates are keystones around which the development must take place. An efficient drainage scheme for the alluvial lands is highly necessary, as is instanced by the fact that in the drainage scheme at Otanomomo land has

been drained and 10 dairy farms have been developed from one block of swamp. Adequate live shelter is also necessary on these downland farms.

The adjacent Kaihiku-Kaiwera region is the area where there is the greatest potential for increased production. Because of its remoteness from a railway and the nature of its leasehold tenure development in this area has been slow. In addition, fencing is at present a major problem and closer subdivision of farms and holdings is necessary.

In the Catlins bush district it is to the soils of the lowland valleys that one must look for increased production. Many of the soils of the southern upland region should be allowed to revert to forest, for agriculturally they are poor. Methods which require serious consideration are the use of the bulldozer in clearing bush and logging up and making tracks for manure dumps, the use of aircraft for fertiliser distribution, and the control of rabbits.

With 189,000 acres of unimproved land in the county and with 491,300 breeding ewes in 1952, most of which will have been carried on the improved country, the potential of the district is considerable and a carrying capacity of 700,000 to 800,000 breeding ewes should be possible. Successful methods of handling the downs country are well known and are being adopted, and with modern methods of handling hill country there is little doubt that there will be a considerable increase in livestock numbers in Clutha County.

### Acknowledgment

The information on soils was supplied by Soil Bureau, Department of Scientific and Industrial Research.



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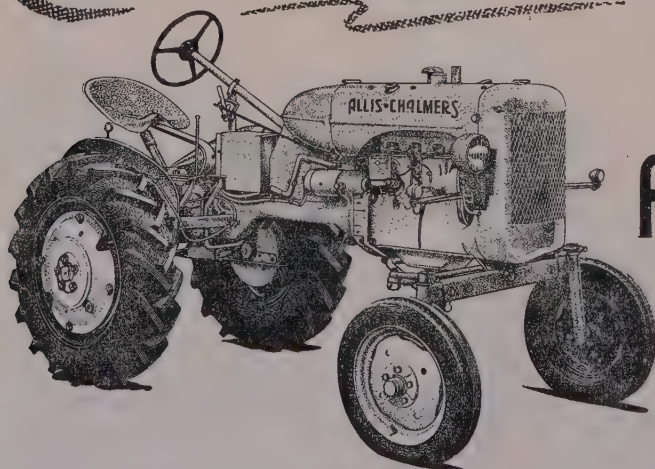
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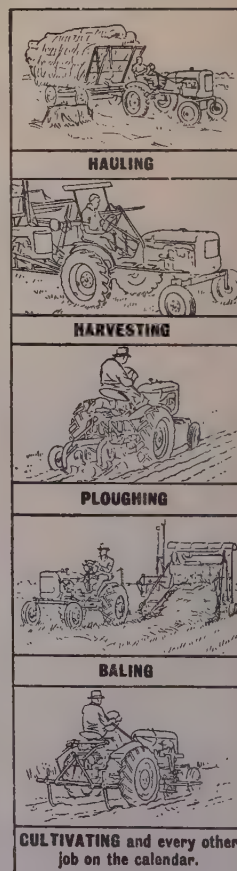


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# Feed Management on Auckland Town Milk Supply Farms

By J. F. TILL, Instructor in Agriculture, Department of Agriculture, Auckland

**T**HE 350,000 people of Auckland consume over 36,000 gallons of milk every day. The supply of milk to meet this huge daily demand is the responsibility of town milk supply farmers, who belong to one of three supply associations. Though demand does not vary greatly during the year, the ability of the farmer to supply the milk does, because he is almost entirely dependent on pastures which have large seasonal variations in their level of production. It is obvious that with this seasonal variation in grass production an even supply of milk is impossible. During spring more milk is produced than is required by the treatment houses for sale to the public, and during autumn and winter the production of the supply associations sometimes barely meets the demand. This article attempts to show how better autumn and winter milk production can be obtained on Auckland town milk supply farms, with a consequent increase in returns and efficiency.

**T**HE average amount of milk produced by town supply farmers which is paid for at the remunerative town milk prices is 50 to 60 per cent. of total production. The remainder is sold to the best advantage at dried milk, cheese, or butterfat prices.

The daily gallonage for which the farmer receives town milk prices (his quota) is gauged on his past performance and is varied each year, depending on his level of production during the most difficult one or two autumn months and one month of the previous autumn and winter supply periods. The farmer does not know in advance which months will be chosen. Therefore, if he wishes to increase his quota, he must ensure that production is maintained at a high level throughout the difficult autumn and winter months. An additional incentive to produce milk during periods when grass production is at a low level is provided by higher prices during autumn and winter.

At present farmers supplying Auckland city produce 20 million gallons annually and of this only 12 million gallons or 60 per cent. is used for town milk. Individual farmers have demonstrated that it is possible to organise production so that 80 per

cent. of the total milk produced fetches town milk supply prices.

## Stock Management

Dairy farmers supplying butter, cheese, or dried milk factories arrange calving dates for the herd as a whole so that full advantage can be taken of the flush months in spring. Town milk suppliers must stagger calving dates so that cows are coming into production at other times of the year. They must in particular have up to, and sometimes more than, 40 per cent. of their herds calving during autumn to maintain or increase their quotas by high production during autumn and winter, and feed supplies must be available to meet the needs of these autumn-calving cows.

## Pasture Management

The first step is to see that pasture production in autumn and winter is raised to a high level. This can be assisted by timing the application of quick-acting phosphates. Slow-acting fertilisers, such as ground rock phosphate, are of little use. Superphosphate applied in early spring increases spring pasture surpluses, so early spring applications of superphosphate should be avoided. Fertilisers applied

in October and early November will increase the summer and autumn growth. For winter and early spring growth pastures should be topdressed in late February and March. So for town supply it will pay to topdress most or all of the farm in October and early autumn. Where the soil is deficient in potash the same position applies and applications of potash in early spring should be avoided.

Fields in good heart containing plenty of ryegrass should be chosen for the application of nitrogenous fertilisers, which can be used to increase winter growth. Applications in April and May will increase pasture production in June and July, and those in July will increase August and September growth. Applications should be made during mild, moist weather to pasture already a couple of inches high.

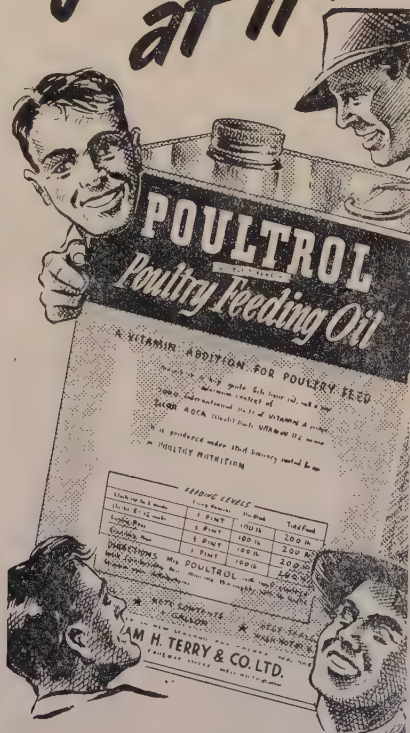
Because of the higher production that can be obtained, pastures should be allowed to grow about 6in. long before being grazed, and the electric fence should always be used to ensure maximum utilisation. Pastures closed in autumn can be saved for winter feed. On factory supply farms this is a common practice, but on farms supplying town milk it can be done only to a limited extent, because of the large demands of the autumn calvers.

On town milk supply farms provision of feed during winter is a serious problem and the ploughing and resowing of pastures with grasses that will provide winter feed is common and a sound practice from this point of view alone, though it may be part of a renewal policy. Seeds mixtures for

**HEADING PHOTOGRAPH:** An Auckland town milk supply area; Flat Bush is in the foreground and Mangere in the distance.



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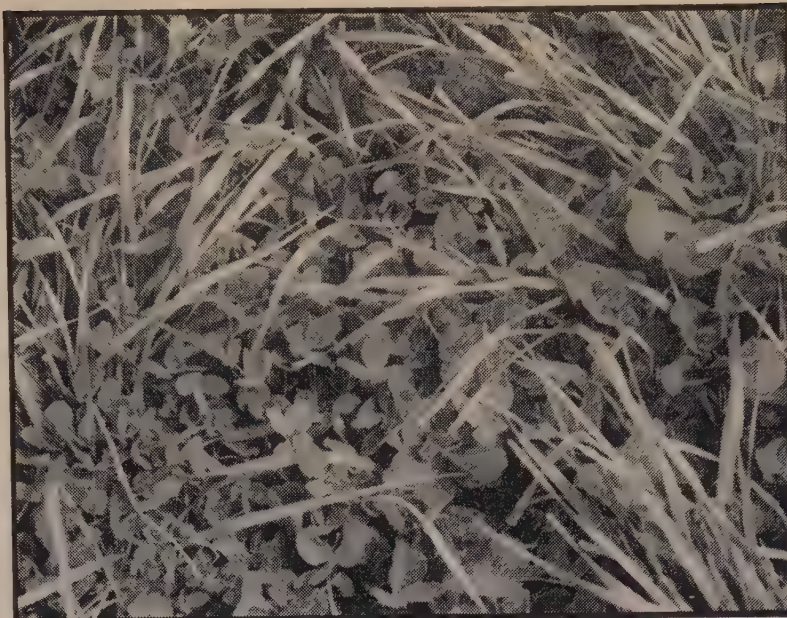
pastures which are to give winter growth should contain a high proportion of short-rotation ryegrass, as in highly fertile well-managed paddocks short-rotation ryegrass can give a bulk of leafy, good milking pasture from July onward. Another grass which provides valuable grazing during winter is cocksfoot. On the lighter soils in the Mangere and East Tamaki districts, seed mixtures of ryegrass, white clover, and red clover, and up to 8lb. of cocksfoot have given excellent winter grazing. Special-purpose pastures of short-rotation ryegrass, broad red clover, and Montgomery red clover are also extremely suitable for town milk supply farms. The short-rotation ryegrass provides the winter feed, and though the ryegrass will run to seed in summer, the red clover will give valuable milking feed during late summer and early autumn.

Short-rotation ryegrass can be introduced by oversowing. On town supply farms the very early spring calvers will be drying off in March and these with the dry stock can be used to hard graze a paddock to be oversown without affecting the production of the milkers. After hard grazing the paddock should be severely harrowed and then sown.

### Silage

In spring on town supply farms the feed gets ahead of the herd as it does on butterfat farms. On town supply farms, however, it is desirable to make more silage than is usually made on factory supply farms because of the requirements of autumn calvers, which will be coming into profit in February and March. In the Auckland town milk supply district a dry period of up to 80 days in summer and early autumn can be expected, and for some of this period quite a high proportion of herds will be in the flush of production. For this period a ration of 50 to 60lb. of silage per cow daily is required, or just over 2 tons of silage per cow. If an average cut of silage is 5 tons per acre, 20 to 25 acres would have to be closed for 50 cows in milk. This figure is high, but if the late autumn is dry, good reserves of silage will maintain milk weights during February to April. This is important, for the production of one or two of these months may be used for calculating the quota for the following season.

Silage will also be required for winter and early spring, and allowance should be made for 1 ton or 1/5 acre per cow. Thus for a herd of 50 cows on town supply (where a crop is not grown) a total of 30 to 35 acres



Above—Special-purpose pasture of short-rotation ryegrass and red clover for winter and late summer feed. Below—Large silage trench at East Tamaki capable of holding 70 acres of silage.

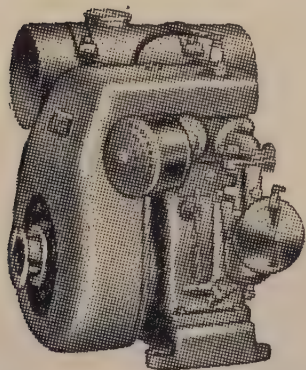


Below—Town milk supply herds may contain Friesians, Jerseys, Ayrshires, Shorthorns, or crossbreds.





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should be cut for silage each year to ensure adequate feeding during the dry period and to supplement pastures in late winter and early spring.

## Crops

Particularly on the lighter soils, chou moellier and turnips are grown for late summer and early autumn feeding. It is not essential to grow more than the herd's average requirement because silage can be used to supplement or replace the crop. Without silage, chou moellier at 50lb. per cow should be fed daily and, if an 80-day dry period is allowed for, a 6-acre crop with a yield of at least 17 tons per acre would be required for 50 cows.

If soft turnips are grown, 6 to 8 acres are required for the same herd, but as cows tend to lose condition on turnips alone, especially after a hard winter, turnips must be supplemented with more silage than is usually fed with chou moellier.

One of the factors that has made turnips so popular on town supply farms is that they can be fed off in breaks with an electric fence. Where the shape of the paddock permits, the breaks should be long and narrow and the crop can be fed off with surprisingly little wastage. Chou moellier, too, may be fed off with the electric fence once lanes have been cut through the crop, but it is more common for this crop to be cut and fed out. If the crop is rationed with the electric fence, the cows tend to leave a lot of chou moellier stalk. On town supply farms chou moellier may not be fed off until late autumn and then the uneaten stalks are a further complication in the unavoidable rush to sow the paddock down to pasture.

With crops, particularly with silage, a common mistake is to start feeding out only after dry weather has lowered milk production. By the time the herd settles down to the silage ration or crop, milk weights will have fallen markedly. The result is that for half an autumn or perhaps a quota month milk weights are reduced. These losses can be avoided if the feeding out of supplements is begun 10 days before feed shortage occurs; the time can be gauged by the feed ahead of the cows and the weather. This early feeding out is done simply to accustom the herd to the supplement. If there are good autumn rains and the pasture freshens, the supplement should still be fed, for the pasture rarely freshens for more than a few days at this time of the year.

## Paspalum Management

In the Auckland town supply district in a dry summer paspalum is the only grass which provides substantial growth. The breaks given to the herd should be increased, and as it is not possible to force the herd to close graze without causing a fall in milk production, seed head and stalky growth will develop. Such pastures must be topped to stimulate leafy growth, which will help to maintain milk production during early autumn. Topping is also important, because untopped paspalum roughage will delay and markedly reduce early autumn growth and germination of ryegrasses. Such a delay in growth can reduce the amount of feed in May, which is frequently a quota month. Furthermore there is no place under good town supply management for

## ... FEED MANAGEMENT ON TOWN MILK FARMS—255

paspalum roughage for winter grazing of dry stock.

## Winter Management of Dry Stock

During winter it is sound practice to break graze the dry stock. If the dry stock are given only a few feet of rationed grass each day, the pasture still to be grazed will not become spoilt or the ground pugged; in fact in an average season some growth can be seen. Hay and silage are fed out on the previous day's break and paddocks so rationed have held the dry stock three times longer than when the electric fence has not been used. This has meant that the area which has to be set aside for the dry stock can be reduced and the great value of this on town supply is that it means that more grazing is available for the milkers during months when it is difficult to supply the quota, let alone exceed it.

## Restricted Grazing in Quota Months

One of the three supply associations which purchase the farmers' milk is partly responsible for fixing the quota for each farm. Independently each supply association, using its own methods, selects one or two of the autumn months (February, March, or April) and one of the winter months (May, June, July, or August) for quota calculation. The months selected are not known to the farmer until after the quota is fixed. The months chosen are usually those in which the lowest amount of milk is received by the supply association or the farmer's lowest months of supply during the three autumn months and the four winter months.

Farmers by studying the weather or grass growth frequently attempt to foretell which months will be selected. This is, of course, quite possible if grass growth is good during February and March and only April remains, but quota months may be difficult to predict early in the autumn or winter period.

At the beginning of February, the first of the three autumn quota months, it may be apparent from the feed position in the supply area that February will not be the autumn month for calculating the quota. The amount of feed allowed to the cows can be slightly reduced or less silage or crop fed to the herd. Both the pasture and the crop may be held over until March. No general rule for this restricted feeding can be given, but if adequate supplies of silage and crop are available, production can be held at the current quota level. During a month when the feed allowed to the herd is restricted care must be taken that the restriction is not so severe that production of recently calved cows and cows more than 4 months in calf is not affected seriously. These should be given a small ration of meal, particularly if the reduction in feed is fairly severe. If this meal ration is allowed to such cows, they are more likely to respond quickly and produce at a higher level in the following month, when high production is needed. Whether the quota is based on the farmers' or the supply associa-

tion's lowest supply months, this practice can still be adopted with benefit.

## Meal Feeding

Meal feeding even with town supply herds must be used with discretion. Meals are expensive and their use must be justified by returns. On town supply farms meals may be used in two ways. First, they may be fed over comparatively long periods such as from late spring to late winter. Here the best results are obtained when the amount fed to each cow is determined by the production of that cow. The use of a test bucket and herd test figures will show the good producers (cows capable of 800 gallons of milk per year) and these can be fed concentrates freely. Cows that are not capable of producing more than 500 gallons per year may obtain all their requirements from pasture. The upper limit of production of any cow is finally determined by her inheritance, and an inherently low producer will not be able to respond greatly to meal feeding. If meals are fed to the herd, the low producers should be identified and they should not be fed valuable meals.

The other time when meals are best used on town supply is during quota months to increase production in an attempt to raise the quota for the following season. If possible, the meal should still be fed in amounts according to the productive ability of the cow. If a meal ration is fed during an early autumn month, less pasture will be needed by the cows. In autumn when meal is being fed the cows should be fed on silage or a crop to appetite, as reduction of this succulent part of the diet can reduce production even though meals are being fed. An extra gallon produced during the months when production is used for calculating the quota may mean an increase in the quota for the next season, and this means that for each day of the whole of the next season more milk will receive the town milk price. Meals fed during a month on which the quota is calculated can therefore increase returns above the extra returns received from the greater immediate supply of milk.

## Study of Monthly Production

Before adopting any of the practices advocated in this article a town milk supply farmer should study the average monthly production of his herd to see whether the autumn or the winter production is limiting the level of the quota for the farm. From this point it should be possible with practices outlined to plan the way in which to increase the quota. This planning is as important as the feeding and breeding of the herd.

For the ever increasing population of Auckland the need will not be so much for more milk, but rather a greater supply during the difficult period of milk production. Moreover, the high sale prices of dairy farms close to Auckland can be justified only if proportionate and, therefore, high net profits are possible. One way in which both problems can be met is by ensuring that more than 80 per cent. of the total milk produced fetches full town milk prices and this means good management and high production during autumn and winter.



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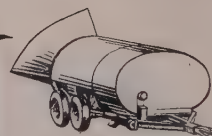
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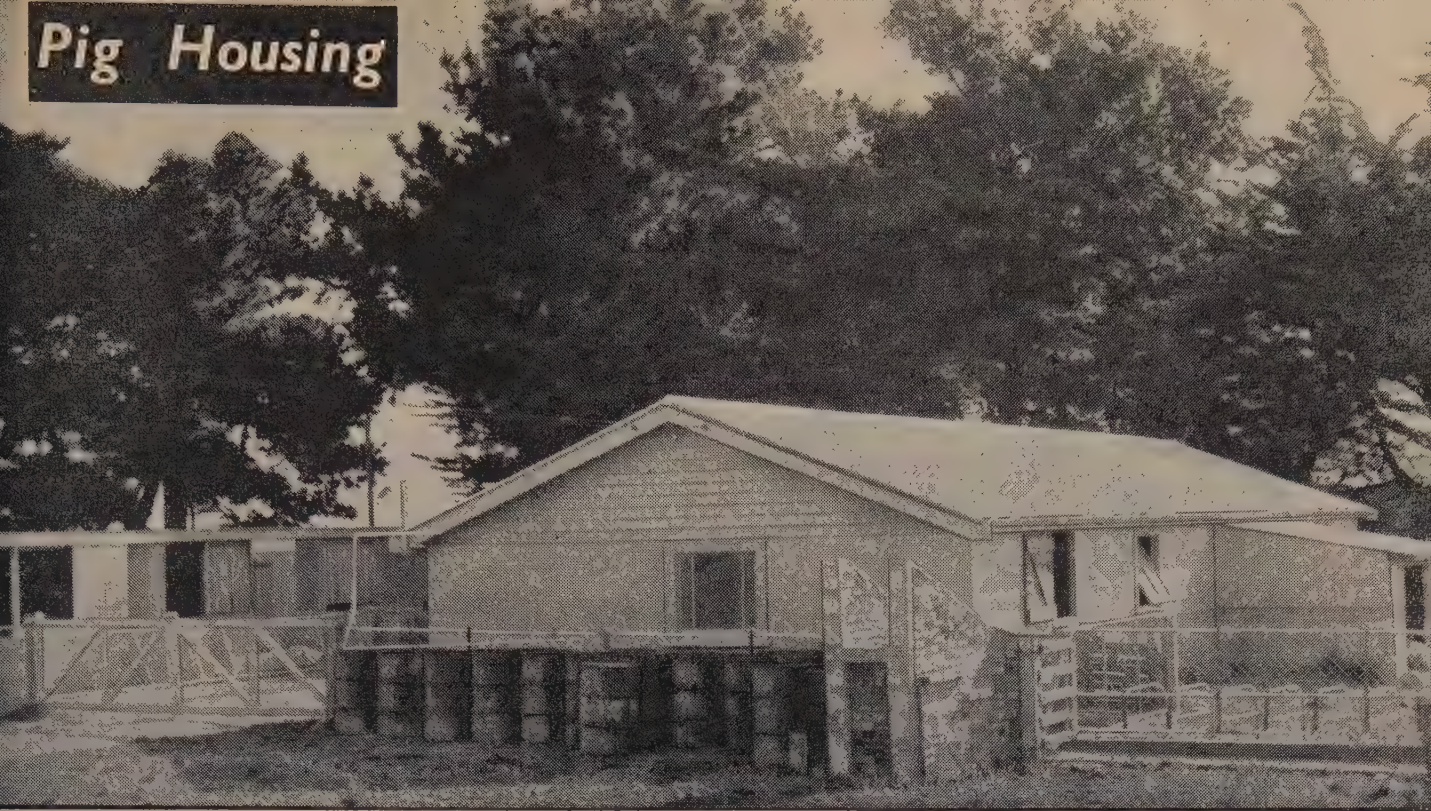
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## Economic Aspects of Housing and Layout

**E**CONOMIC and farm-management aspects of pig housing which are of paramount importance to producers are discussed in this article by A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington. It is the second of a series in which present knowledge of pig housing is reviewed. In the first article, which appeared in last month's "Journal", E. D. Edwards, Technical Officer, Animal Industry Division, Department of Agriculture, Wellington, discussed housing in relation to the health, comfort, and food-conversion efficiency of the pig.

**T**HE question which naturally arises is: Can New Zealand producers afford to build the type of housing which will provide the comfortable environment described? The economics of pig housing and piggery layout fall into two main headings: First costs and the materials used in construction on the one hand; working and maintenance costs on the other. The housing which can be provided will frequently have to be a compromise between what is best and what is economically feasible, but it is possible to indicate the best course to take according to the outlay that can be made. Details of designs which have proved satisfactory will be dealt with in future articles.

### Importance of Convenient Layout

During the pioneering period in the development of the dairy industry pigs were regarded mainly as a necessary evil to dispose of embarrassing dairy by-products, and therefore little thought was given to the comfort of the animals or convenience of the man feeding them. Twenty years ago through the influence of an economic depression and the work of Pig Recording Clubs considerable attention was given, for the first time in New Zealand, to providing conditions in which pigs could play their full part as "mortgage lifters".

Emphasis was placed on taking advantage of the natural conditions of clean grass runs to maintain pigs in good health and some attention was given to convenient layout of the piggery. Subsequent developments tended toward more centralised layouts in which concrete was used to a greater extent in both buildings and control yards. This

trend in design tended to give more weight to questions of ease of feeding, cleaning out, etc., sometimes to the detriment of the pigs' comfort.

Where a "permanent" type of house constructed in concrete and with a useful life of, say, 30 years is being built care taken to ensure that the building satisfies the following requirements will be well repaid:—

It should enable the pigs to make the maximum use of their food.

It must enable the appropriate number of pigs to be fed, kept clean, and generally handled with the minimum of time and effort.

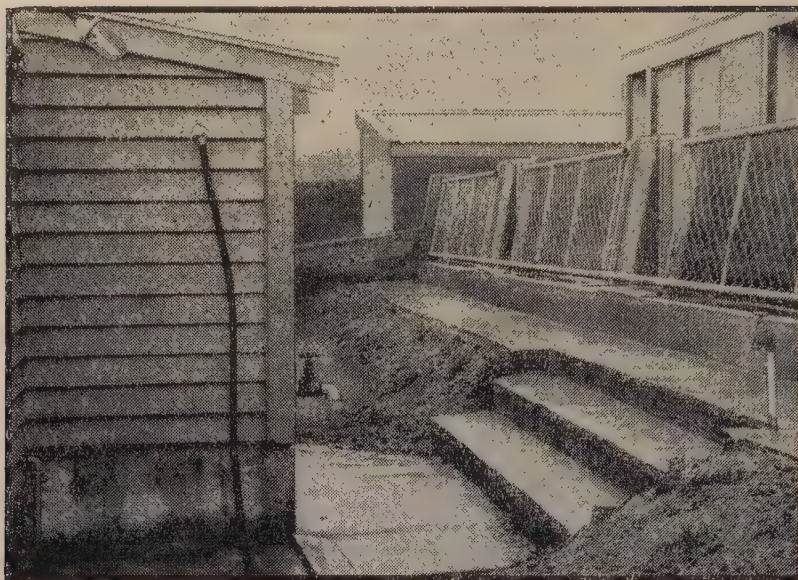
### Capital Outlay

On some farms fortunately situated with respect to soil type and natural shelter it may be possible to provide healthy conditions for pigs with very little expenditure. Examples of this are where there is good ground shelter such as fern, flax, or pampas grass, preferably supported by windbreaks of exotic plantations or native bush. Where such conditions exist on dry, well-drained soil in the North Island expenditure on conventional housing may be unnecessary. There would be some risk of losing piglets born out during the colder months, but the insurance provided by carrying an extra sow would usually be preferred to the capital outlay on an expensive piggery.

However, as farm development progresses fewer properties have good "natural" conditions. Artificial conditions should, with proper management, enable better results to be obtained than under the best "natural" conditions. It is a mistake, of course, to imagine that pigs can be under truly natural conditions on any farm, as the system of feeding is unnatural.

**HEADING PHOTOGRAPH:** Mr. C. Brown's piggery, Makerua (Manawatu), is a good example of an efficient, labour-saving design. Farrowing units in a continuous row face on to a central race on the opposite side of which is the fattening house (centre). Dry-sow accommodation is provided by a lean-to on the north side (right of illustration) of this fattening house, and dry-sow feeding bails are built over the trough.





Centralised piggy in which the skimmed milk tank is built into the front of the fattening house (left) and provided with a second tap at the back for convenience in feeding pigs in the farrowing units (right) and dry sows (middle distance).

A system of progressive development in which profit from pigs is used to improve housing may be followed. Temporary housing of straw bales, etc., and other cheaper forms of construction can be used until sufficient capital has been accumulated to finance the building of a permanent layout. Alternatively other assets may be used to secure finance for the piggy at an early stage in the farm development.

Where the latter course is followed it is obviously of greater importance that planning of layout, building methods of construction, and working facilities should be sound. Within the limits of the finance available the higher capital outlay is generally preferable if it will result in reduction of the annual overhead charge by lowering maintenance costs and depreciation. The same argument applies if additional capital investment in building will result in food-conversion efficiency being improved to an extent to cover full interest and depreciation charges on the extra capital outlay.

It has been shown overseas that differences of the order of 10 per cent. in food-conversion efficiency between farms may be ascribed to the influence of housing. It is known that much bigger total differences in efficiency occur between farms in New Zealand, but how much of this difference is due to differences in housing is not clear. It is possible, however, that a loss of 10 per cent. of the potential weight gain of pigs in a poor type of house as against a good one is not exaggerating the position. Therefore, if only 10 pigs per pen per year are turned out from the good house, the value of one of those pigs would represent the amount of money available to meet annual interest on the extra cost of one unit of the better type of house. At present the value of the one pig may be put down conservatively at £10. This would pay interest on a capital investment of £200 per unit above the cost

of the inferior house. Probably the actual difference between the better type of unit and the inferior house would not be more than £20.

In some cases where expensive but cold concrete houses have been erected savings in first cost could have been made and at the same time the houses built to a more efficient design.

### Labour Costs in Pig Meat Production

Studies of production costs (excluding any cost of the skimmed milk or whey, which is simply a by-product of the dairying enterprise) have shown that the value of the time given to pigs (costed at the level of the standard labour reward under the guaranteed price for butterfat) is approximately half the total cost of production per pound of pig meat.

On all dairy farms labour is a limiting factor and time saved in any operation is definitely money saved, as that time can be devoted to some other productive aspect of management.

As labour costs loom so large in pig meat production costs, it is important that piggy buildings and layout should be designed so that feeding, cleaning, and all handling operations can be carried out quickly and efficiently. The cost of efficient types of houses need not be substantially different from that of a less efficient design, and the provision of a convenient layout and facilities for handling pigs is largely a matter of careful planning. It is here that the experience of the advisory officers in the field, who have the benefit of the experience of many practical men, can be most helpful.

### Planned Layout

If there is a choice of sites for the piggy, one that is handy to both house and cowshed is preferable, and it is an added advantage if the piggy can be on one side of a path between

the house and cowshed, as the piggy is then under frequent supervision when necessary. Though frequent feeding of fattening pigs is not required, it is essential to keep an eye on sows due to farrow, and weaner pigs should get at least three feeds per day.

If the layout is permanent with concrete yards, drainage must be given careful consideration. Complete exclusion of drainage from the pig runs is essential and for this disposal through a septic tank is one suitable method. The high manurial value of the drainage should not be overlooked, however, and if there is a liquid-manure tank to take drainage from the cowshed, the piggy could be connected up to this if convenient. If a pump driven by the power take-off of a tractor is used for emptying the cowshed drainage sump, it may be cheaper or more satisfactory to have a similar sump at the piggy.

When the site and type of buildings have been decided the siting of farrowing units, fattening house, and dry sow and boar accommodation must be considered as a whole as well as the disposal of these units about some centre at which milk container and meal house are situated. Since the meal house must be accessible by truck, it will frequently be convenient to make this centre the site of holding yards, weighing and ringing race, and loading ramp, etc., where on and off loading of stock will be carried out.

### Building Materials

Whether a centralised piggy largely of concrete or an open-air layout with timber as the main building material is chosen will depend largely on the relative costs, soil type, and type of production.

In districts close to sawmills it may still be possible to build economically in timber, but for a permanent building it will generally be more satisfactory to use concrete for floors and dwarf walls to at least 2ft. high.

Where it is cheaper, construction in well-seasoned timber of small, movable huts—provided these are draught proof and are fitted with a well-insulated roof and controllable ventilation—is very suitable for the open-air type of layout on free-draining soil, particularly if porker production is the main aim.

The plan for a concrete house should include provision of adequate hard fill and a damp course under the sleeping floor. The materials in the aggregate and the form in which they are used should be such that they will assist in securing the maximum possible insulation where this will assist in keeping the pigs warm. Further aspects of this subject will be dealt with in discussions of designs in later articles in this series.

### Run-out from Houses

The whole layout must be planned in relation to the area available for a run-out. Individual pens for each unit are not necessary, even with farrowing houses. Large runs which can be cultivated in turn to prevent a build-up in the soil of the parasites and disease organisms which affect pigs, resulting in what is popularly known as "pig sick" land, are preferable. Several house units can share one such run and provision should be



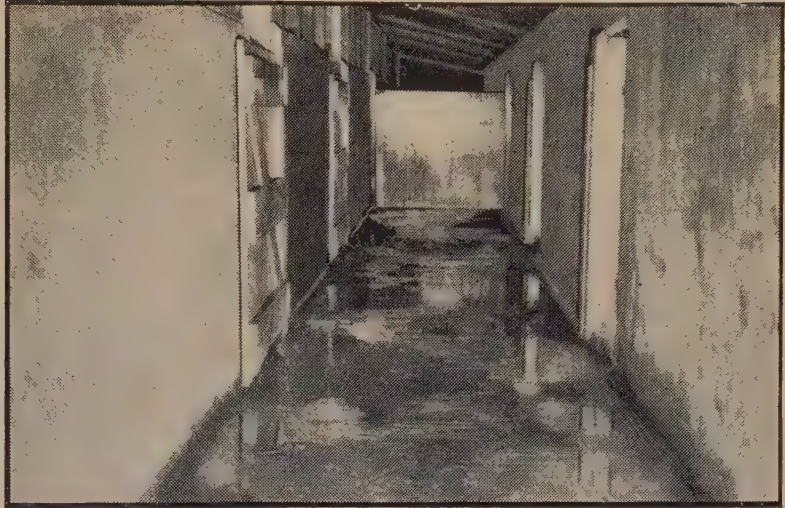
made for convenient access for pigs to another run when the run adjacent to their houses is under crop.

### Fattening House Design

No research work on the details of design suitable for New Zealand conditions has so far been carried out. The tendency has been to follow designs which have been developed overseas under radically different feeding, climatic, and management conditions and to adapt them to local conditions. By a system of trial and error details of design for New Zealand conditions are emerging.

Faults sometimes occur through an imperfect understanding of the underlying principles of types of houses and of management in them. Disappointing results obtained from most of the expensive Danish type piggeries in this country stem from failure to design for efficient insulation and ventilation and to appreciate the necessity of keeping houses stocked to the capacity for which they are designed if pigs are to keep themselves reasonably warm in cold weather. This problem is further complicated by the fact that liquid feeding creates ventilation difficulties. Evaporation of large quantities of liquid causes undesirable cooling in all but the warmest months; yet ventilation must be adequate to remove ammonia which arises from the evaporation of urine.

Under the system of pig raising at present practised in New Zealand few pigs (usually small ones, which produce relatively little heat) are on hand in winter. The multi-unit house with high stud then becomes unsuitable, as the pigs cannot keep the temperature in their beds at anything like the optimum. They become wet and dirty and do badly and it becomes necessary to build a low kennel over their sleeping quarters so that they are able to keep themselves reasonably comfortable. If this is the position, it is questionable whether there was any justification for building the large, expensive house in the first place.



This enclosed dunging race gives protection for pigs in all weathers, but because of its inclusion the roof of the house has to be higher than would be necessary otherwise. The higher roof presents a problem in insulation so that satisfactory warmth is retained in cold weather.

Though the general principle of provision of a dunging passage in a house of the Danish plan is sound and this feature works particularly well with grain feeding, the case for the inclusion of a passage in New Zealand designs has not been proved so clearly. This applies particularly with whey feeding and other cases where very little meal supplement is used with the dairy by-product.

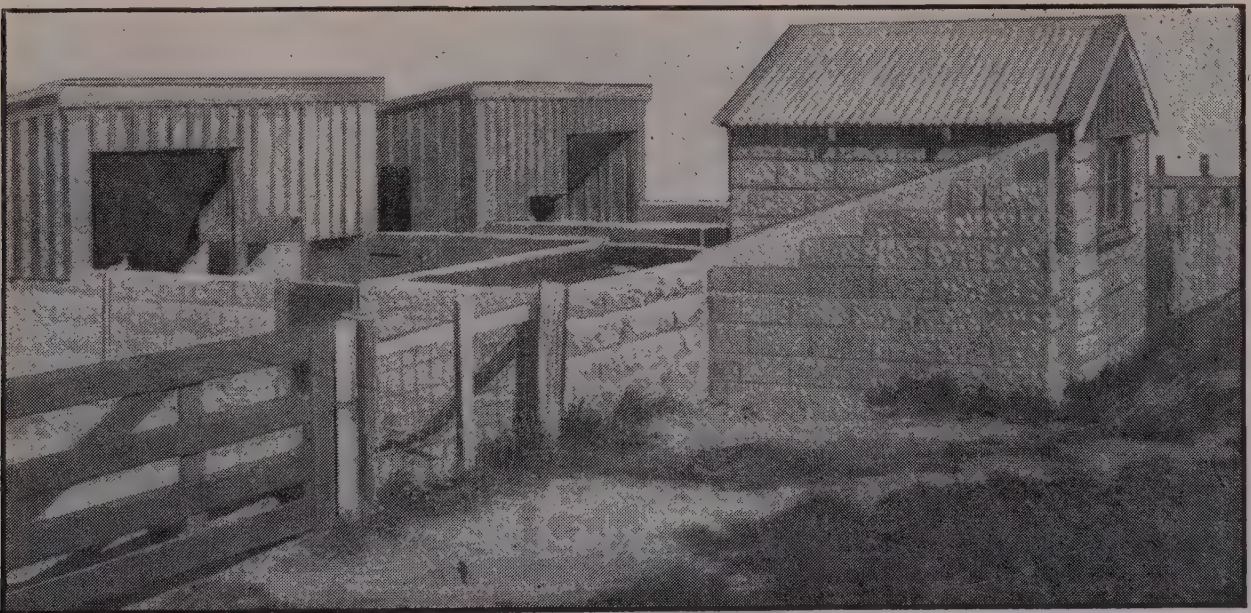
Opinions differ as to whether a dunging passage, if included, should be roofed over or left uncovered. There are also differences of opinion on other details of design. Officers of the Department of Agriculture are

keen to co-operate with producers in studying these questions more closely to observe details of designs, management methods, and production under a variety of conditions.

### Farrowing Houses

Surveys of pig production both in New Zealand and overseas have shown that loss of piglets at farrowing is one of the major sources of inefficiency.

In the conventional, square-floor type of farrowing house satisfactory results can be obtained if the house is warmly constructed and the air space is not greater than necessary to provide convenient access for atten-



Truck access for delivery of meal and transport of pigs is well provided for in this farm piggery.





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You owe it to yourself to investigate any new development that will save time and reduce maintenance costs on a farm. Get to know more about Contour Pipe for instance. It's plastic, flexible and almost indestructible—the very latest development in water and skim milk reticulation.

Contour Pipe can be joined simply by butt welding from the heat of your blow lamp, threaded or adapted to take compression fittings for linking to existing runs. Due to ease of laying and unlimited life, installed cost is less than any other pipe. It can be laid at speed behind a mole plough or trenched in the normal manner. It comes in 50, 100, 200 and 500 foot coils.

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In this piggery the dunging races are not roofed and the roof over the sleeping area is kept low. Milk is piped to troughs.

tion to the sow. The one feature which has proved of definite value in all farrowing houses is a warm safety zone, which in a square house is usually a fenced-off brooder in one corner. Infra-red lamps are used widely as the source of heat, but as light and heat have been found to attract young piglets more readily than heat alone, the bright emitter infra-red lamp is preferable to the dull emitter infra-red unit.

Results from existing types of farrowing houses can be expected to improve appreciably if brooder lamps are installed, and their use is strongly recommended. Where there is no wiring for electric light to the piggery satisfactory results can be obtained with a kerosene-burning brooder lamp, of which at least one make is available in New Zealand. By contrast the ordinary storm lantern is very ineffective.

### Feeding Arrangements

Arrangements for feeding and cleaning out, the tasks most frequently repeated, must be such that the routine is simplified and work reduced to the minimum. First, the milk container and meal house should be centrally situated; the other main points are:—

The height of the outlet from the container should be convenient for the filling of feeding buckets.

A quick-acting valve of the honey-gate type, with not less than 2in. outlet, should be used.

The container should be easily cleaned and, if necessary, steps should be built to provide easy access for cleaning. Though direct piping from the container to troughs is not generally recommended, because of the difficulty of control over quantity fed, this method should not be entirely overlooked, particularly where labour is extremely short or in large establishments where whey or buttermilk is the basic feed.

Troughs should be centrally placed and arranged so that milk can be poured in from outside the pen. Troughs along the front of the pen with a sloping or swinging door front are most suitable where much meal or other dry feed is used. Chutes extending to the end of the trough under the front wall of the pen will provide easy means of filling the trough placed along the side of the pen. The size of troughs should be appropriate to the size of the pigs; they should be capable of being quickly emptied or drained and cleaned. Where a general-purpose house with trough large enough for baconers is used for weaners either a lower, temporary trough should be provided or a 9in. x 2in. plank or other similar step should be placed in front of the exist-

ing trough. Troughs should be placed so that pigs cannot get into them and foul their food. For a trough other than that under a sloping front, which is the ideal arrangement, a special superstructure which will prevent pigs getting into the trough should be built. Troughs should be fixed so that pigs cannot shift them.

Water troughs or bowls should be conveniently placed in the pens with automatic control or a tap handy but not where pigs can turn it on or damage it.

The meal house should provide storage space for a quantity of meal appropriate for the size of piggery. A separate rat-proof concrete bin—not too deep, so that the bottom can be reached with ease—should be provided for each kind of meal. In large piggeries where a hammer mill is installed to mill whole grain an inverted-cone elevated grain hopper feeding direct into the mill may be warranted. The meal house should provide facilities for keeping records and a medicine cabinet should be fixed to the wall of the house. It should be kept locked and may be used for storage of any surgical equipment.

Creeps must be provided in farrowing or sow-and-litter houses. It is very convenient if the creep can be shut easily when the pigs are in it, as they can then be caught readily for castration, weighing, earmarking, examination of teating, etc.

Dry-sow accommodation should be provided with bails over the feed trough, which should be partitioned to enable proper control of the quantity fed, which must be adjusted to the condition of the sow.

### Cleaning

All advantages of improved sanitation through the use of concrete for piggeries are lost unless the houses are kept clean. It is necessary therefore

### Free Bulletins for the Pig Farmer

Nos.

- 15 Causes of Excessive Waste in the Pig Industry.
- 230 Castration of Pigs.
- 243 New Zealand Baconer and Porker Carcass Judging Standards.
- 302 Rejection of Pigs by Works.
- 343 Crops for Wintering Pigs.
- 364 The Feeding and Management of the Sow and Litter.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.





The covered loading platform is a feature which could profitably be incorporated in the layout in many piggeries.

to plan for ease and speed of cleaning out. Pigs can be trained to develop clean habits and pigs so trained can be assisted to keep quarters clean by the following features in design of houses: The floors should have a rapidly drying, impervious, uniform surface correctly graded. A fall of  $\frac{1}{2}$  in. to the foot away from the trough, situated at the highest point on the feeding floor, should be allowed and a dunging area provided at the lowest part of the pen. The sleeping area may be raised 3 in. or 4 in. above the feeding area.

If a number of units is placed together so that the dunging areas provide a race along the back of the pens, cleaning out should be simplified to the greatest possible extent. Once the pigs have been trained to the use of the dunging race, and provided they are carefully managed and fed, it should seldom be necessary to clean the rest of the floor. However, it would probably not be possible to maintain this standard with pigs fed on whey.

Water taps should be provided so that a hose can be used throughout the building when necessary, but they should be placed where pigs cannot turn them on or damage them.

All internal corners should be coved to prevent accumulation of dirt.

Suitable cleaning equipment, including hose with nozzle, yard broom, and square-mouthed shovel, should be stored in the feed house or weighing shed.

Where drains pass from a closed building to the outside there should preferably be a trap that can be cleaned easily. Open drains should be wide enough to take a broom and relatively shallow. Deep drains under doors allow piglets to stray and deep drains generally are a hazard. Outside drains should have very little fall; 1 in 250 is sufficient.

Where a sump is provided it should be adequate for the number and size of the pigs to be accommodated. If the liquid manure is to be used on the farm, it is wise to allow a margin of safety in the capacity of the sump in case of breakdown of the normal routine of emptying. Roof water should be prevented from draining into the sump.

### Handling the Pigs

The whole layout should be planned so that pigs can be controlled from the time they are farrowed—through the operations of castration, weaning, and transfer to fattening house or via handling yards and loading ramp to the carrier's truck. A system of races with gates planned to give control of the pigs being worked will enable pigs to be moved anywhere about the layout with the minimum of trouble. An old sack or rubber stopper and light hurdle are useful adjuncts to easy, quiet movement of pigs.

Gates should be hinged and fastened in such a way that pigs cannot lift them off their hinges or catches. If a pig cannot see through a gate, it will generally show less desire to get to the other side. For this reason gates made of flat asbestos board nailed to wooden framing or cut from light steel plate are very satisfactory. In totally enclosed houses, where full control over ventilation is the aim, correctly fitting framed doors are required.

The general handling facilities which are useful in the piggery, in order of importance, are:—

**Loading ramp:** This should provide a rise of 3 ft. 4 in. in not less than 9 ft. The floor may be of rammed earth contained between concrete walls, of 10 in. concrete steps with 4 in. rises, or of timber (alternate 6 in. x 1 in. and 3 in. x 2 in. cross-pieces laid with  $\frac{1}{2}$  in. spacing on 6 in. x 2 in. bearers).

A crush gate at the bottom of the ramp facilitates handling of recalcitrant pigs. Alternatively or in addition a holding platform is sometimes built at the top of the ramp. If this is roofed over, it provides a very satisfactory solution to the problem of having the pigs handy for the carrier without waiting for him to arrive.

**Crush race with head bail:** The head bail is a most convenient device for such jobs as ringing, detusking of boars, and any other operation which has to be carried out single-handed, particularly on mature pigs. It is a good idea, especially for the man who has to work on his own, to give the floor of the crush race a steep fall (at least 4 in. to the foot) toward the head bail.

**Weighing crate:** The crate if portable may be placed in the crush race. If platform scales are used, another site in the yards, preferably roofed over, will have to be found.

**Foot bath:** This may be in the crush race or in a convenient race on the side of the fattening house leading to the handling yards. A 4 in. deep bath with floor at a level which will enable the bath to be emptied into an adjoining drain is a useful adjunct in any concrete piggery, particularly in districts where pig foot-rot is common.

### Conclusion

Erection of a new piggery is a major step in farm development, and as the farmer will have to operate it for a long time, it should be planned carefully. Small details can make a great deal of difference to convenience and in aggregate over the years to the amount of time and money saved or lost.

Field officers in pig husbandry both within the Department and the New Zealand Pig Producers' Council organisation are continually studying the results obtained under different conditions and can assist the producer who is planning to build.

Layout design and the management which is applied interact. A good man will get better results from poor facilities than will an indifferent manager from the best conditions. An efficiently designed piggery does not, in itself, ensure good returns, but it makes such returns possible and subject only to the limitations imposed by the efficiency of management and the livestock employed.

The Department of Agriculture is prepared to work with farmers with established piggery layouts of varying type to study the following aspects more closely:—

Comparisons of efficiency of different designs of house for the purpose for which they were designed; for example, efficiency of farrowing houses in minimising losses and of fattening houses in respect to gains of the pigs housed.

Detailed studies of the time taken for various operations with different layouts and under varying methods of management.

Farmers who are prepared to co-operate in such studies with a view to keeping abreast of the latest practical developments are asked to get in touch with the Superintendent, Pig Industry, Department of Agriculture, Wellington.



# Common Pests of the Home Garden

**C**OMMON pests of some of the widely grown garden vegetables were discussed by B. G. Mills, Horticultural Instructor, Department of Agriculture, Wellington, in last month's home garden article. In this article he deals with general pests and control of them. The section on garden work for April is by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

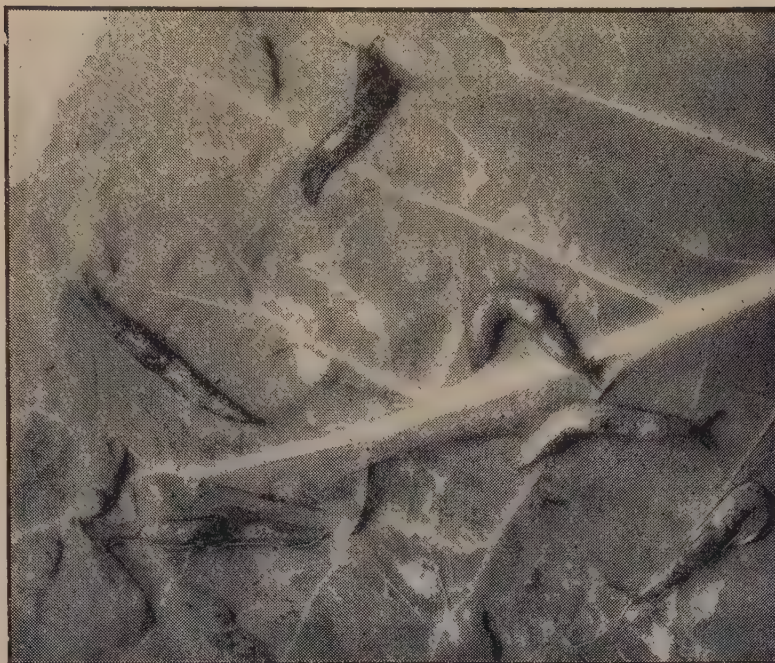
**R**ECOMMENDATIONS include the use of H.E.T.P. (hexaethyl tetraphosphate) and T.E.P.P. (tetraethyl pyrophosphate) sprays, and the precautions which are essential in the handling of these materials have already been set out (see the February "Journal", page 161).

## Slugs and Snails

Probably the most common and destructive pests of the home garden are slugs and snails. They attack a wide variety of newly planted crops and cause damage by chewing pieces out of the young growth, leaving a trail of silvery slime indicating their presence. Young plants of lettuce, cucurbits, brassicas, peas, rhubarb, and many other plants are subject to severe damage. Slugs and snails are active during wet or humid weather and are most troublesome at night, especially during spring and autumn, when young plants are transplanted. The eggs of snails are round, semi-transparent, and jelly-like, and are laid in clusters in moist situations. During the day, dry periods, and winter slugs and snails are quiescent and may be located in shaded, moist places, usually under weeds, boxes, etc.

## Control

The best method of controlling slugs and snails is to use a bait made from bran and metaldehyde. Mix 1oz. of metaldehyde powder to 3lb. of bran and



[Green and Hahn]  
Common slugs, which cause considerable damage to plants, are best controlled by poison baits.

moisten with water so that the mixture can be squeezed into small cakes by hand. Substitutes for bran are pollard, maize meal, or brown bread crumbs. In the evenings place small heaps about 1ft. apart where the slugs and snails have been active. If metaldehyde is unprocureable, one of the following may be used, but they are less effective:—

**Paris green bait:** Mix dry 25 parts of bran (or substitute) with 1 part of paris green and moisten with water to a crumbly mixture. Molasses may also be added to the water before the mixture is moistened. Sprinkle the bait in the evenings where the pests are active. A useful formula is: Bran, 3lb.; paris green, 2oz.; water, about 3 cupfuls; and molasses, about 1 cupful.

**Dehydrated copper sulphate:** Another method which has given good results is the use of a dehydrated copper sulphate dust. Heat ½lb. of copper sulphate (blue-stone) in a tin until it is reduced to a powder, mix the powder with 3lb. of

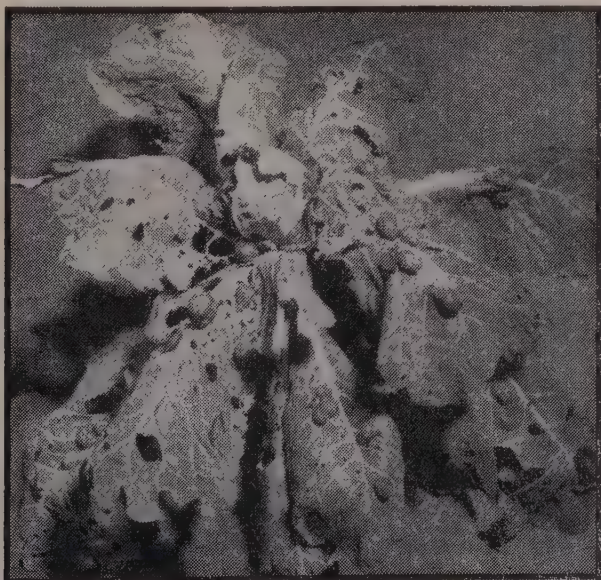
hydrated lime, and dust the mixture lightly over the affected area in the evenings.

**Hydrated lime** broadcast in the evening is useful.

For good control garden hygiene is important to eliminate the hiding places of these pests. Old boxes, heaps of rubbish, long grass, weeds, etc., should be removed from the garden. If slugs and snails are collected, they can be killed instantly with common salt, lime, or boiling water.

## Springtails

Springtails (collembola) are small insects which jump rapidly when disturbed. They are wingless and white, yellow, or brown to black. The darker types eat small round holes in the developing leaves of young plants and

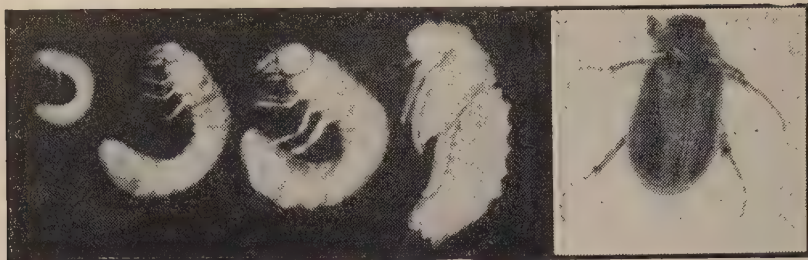


Cabbage plant attacked by snails, which damage a wide range of vegetables.



A typical springtail.





Above—Grass-grub. From left: First, second, and third stages of grub; pupa or resting stage; adult beetle. Below—Grass-grub damage to carrots; undamaged carrot in centre.



if infestation is severe, they will restrict growth. The tiny white springtails in the soil damage germinating seeds of cucurbits, beans, carrots, celery, lettuce, onions, and tomatoes. Springtails are generally found where the soil is damp and usually occur in colonies.

#### Control

**White soil springtails:** Soak the soil well with two applications of nicotine sulphate at the rate of 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added.

**Brown to black springtails:** Use the same formula, but add 2oz. of wettable sulphur to the 4 gallons of mixture.

Alternatively, dust plants with 2 per cent. D.D.T. dust.

#### Grass-grubs

Grass-grubs (*Costelytra zealandica* Wh., previously named *Odontria zealandica*) although most troublesome in lawns and pastures, attack the roots of a wide variety of other plants other than grasses. Vegetables damaged by the grubs include artichokes, brassicas, carrots, cucurbits, lettuces, and tomatoes. The grub is creamy white, about  $\frac{1}{2}$  in. long, and has a characteristic U shaped body. The adult beetles, which fly at night, eat holes in the leaves of some vegetables and may cause defoliation. The beetles are slightly less than  $\frac{1}{2}$  in. long and brownish.

#### Control

Before vegetable plants or seeds are put in, make sure there are no grubs in the soil, especially where garden soil is broken out of grass. If grubs are found, cultivate the soil frequently to expose them to birds before growing vegetables.

**To control the beetles** spray with 50 per cent. D.D.T. wettable powder at the rate of 1oz. to 4 gallons of water.

**To control the grubs** mix  $\frac{1}{2}$  lb. of 50 per cent. D.D.T. wettable powder with 10lb. of dry soil, sand, superphosphate, or lime and apply 1oz. of this mixture to each square yard over the infected area. It is important to keep the D.D.T. in the top inch of soil; do not dig it in.

A dry insecticidal powder like that above is best applied with fertilisers, dry sand, or soil to give a uniform distribution of the relatively small amount of powder. (See March 1953 issue of the "Journal", pages 205 and 206, for methods of distributing dusts.)

#### Wireworms

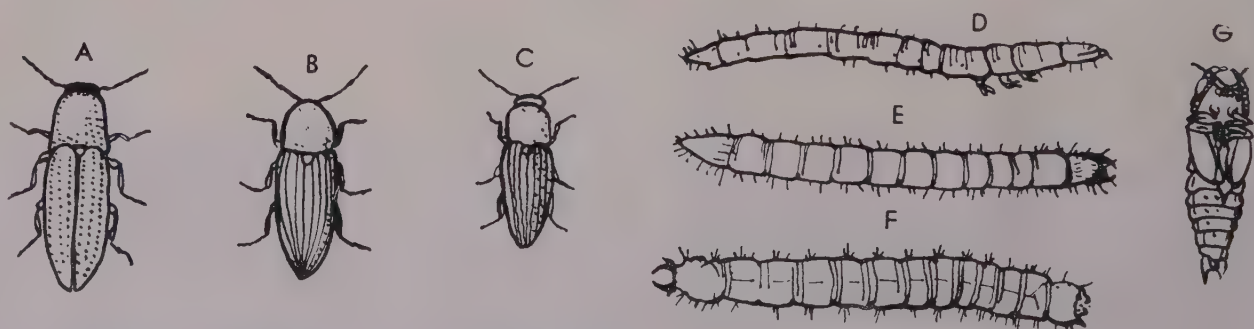
Wireworms, of which there are several species, are immature forms of click beetles. They vary in colour according to species from reddish- or yellowish-brown to brown, and are shiny, hard, and wiry. They have three pairs of legs just behind the head, and the body is well segmented. They tunnel into potatoes, carrots, and many other root crops, especially in garden soil which has been formed from grassed areas.

#### Control

Before vegetable seeds or plants are put in make sure that no wireworms



[Green and Hahn  
Species of wireworms, the immature forms of click beetles.



A, B, and C—Click beetles (adult wireworms) of the species *Agriotes lineatus*, *A. obscurus*, and *A. sputator* respectively. D, E, and F—Wireworms. D—Side view of *Agriotes* wireworm. E—Upper surface of *Agriotes* wireworm. F—Upper surface of *Athous* wireworm. G—Wireworm pupa.





Stages in the development of the subterranean grass caterpillar.

are present in the soil, particularly where soil has just been broken in from grass. If wireworms are present, cultivate frequently to expose them to birds.

Bait trapping before planting may be practised if the labour involved is warranted. Baits can be prepared from cull potatoes cut in halves or from slices of other fresh vegetables. The baits, which should be placed in furrows 2 to 3 in. deep and 3 ft. apart each way, will attract large numbers of wireworms. The baits may be lifted a week after being laid down and the attracted wireworms destroyed. This procedure should be repeated as required.

### Subterranean Grass Caterpillars

Subterranean grass caterpillars (*Oxycaenus* sp.) are frequently confused with grass-grubs and often occur together, causing similar damage, especially to lawns and vegetables. The grass caterpillar is the immature form of a moth and is dark brown, rather limp, and with a straight body, whereas the grass-grub has a typical U shape. The body of the grass caterpillar has several stumpy legs just behind the head and several more pairs of accessory legs or "tube-feet" further back. Colour and size vary

with species, length ranging from  $1\frac{1}{2}$  to 4 in. In gardens the caterpillars feed underground on roots of plants such as tomatoes, but in lawns (where the presence of caterpillars is indicated by holes about the size of a pencil) caterpillars live underground but come up to feed on the leaves of grasses.

### Control

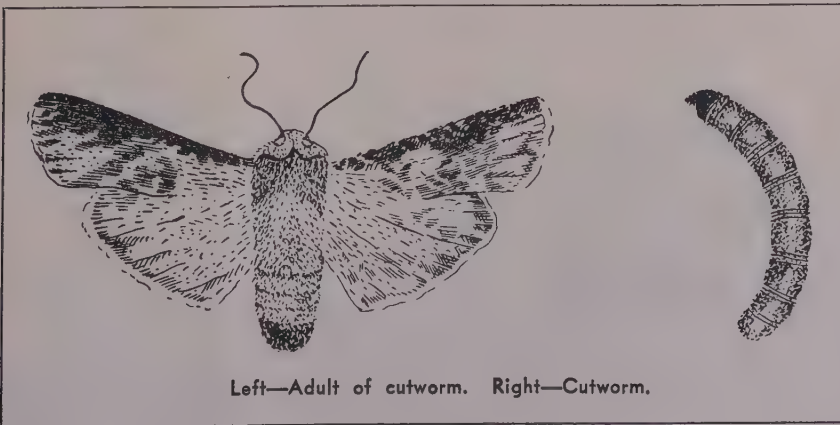
Newly broken in garden soil from grass land should be inspected and if caterpillars are present, the soil should be turned over frequently to expose the grubs to the sun and birds. This should give some control. A second measure is to treat as for grass-grubs with D.D.T. powder.

### Cutworms

Cutworm caterpillars (*Agrotis ypsilon* Hfn.) when fully grown are about  $1\frac{1}{2}$  to 2 in. long, light grey to brown, and fairly plump. These caterpillars are active during the night, when they cut off plants at or near ground level. Plants will be found lying wilted on the ground the next



[From "The Agricultural Gazette of New South Wales"]  
Vegetable weevil. Left—Adult.  
Right—Grub.



Left—Adult of cutworm. Right—Cutworm.



Adult female moth of the subterranean grass caterpillar.

day. Cutworms will be found 1 to 2 in. below the soil in curled up positions close to damaged plants. Vegetables that are attacked include tomatoes, cabbages, cauliflowers, and lettuces which have been transplanted. They also may eat into lettuce hearts and into root crops. The adults of cutworms are night-flying moths which are greyish brown with black areas on the fore-wings.

### Control

**Moths:** Clean cultivation and control of weeds will remove the hiding places of the moths.

**Caterpillars:** Use paris green bait (see section about slugs and snails on page 263). An alternative control measure is to dust the ground around the plants with a 2 per cent. D.D.T. dust.

D.D.T. 50 per cent. wettable powder at 1 oz. to 3 gallons of water sprayed toward the bases of the plants and on the surrounding soil may be effective.

### Vegetable Weevil

The vegetable weevil (*Listroderes obliquus* Gyl.) feeds only at night and lives in the soil by day. Weevils chew out leaf stalks, causing wilting. The adult weevil is about  $\frac{1}{2}$  in. long, brown to greyish with a light greyish-white V-shaped mark on the back, and has the typical weevil snout. Each female lays up to 500 eggs each season and the grubs developing from these eggs grow to about  $\frac{1}{2}$  in. long. These grubs are legless and sluggish and, except when young, remain in the soil at the base of the host plant during the day. The grubs pupate after about 90 days in the top 2 in. of soil, later developing into the adult weevils.

### Control

As the weevil feeds on many weeds (mallow, cress, etc.), weed control is important. Dust with 2 per cent. D.D.T. or 2 per cent. D.D.D. dust. An alternative is to spray with D.D.T. 50 per cent. wettable powder or 25 per cent. D.D.D. wettable powder at 1 oz. to 4 gallons of water or lead arsenate at  $1\frac{1}{2}$  oz. to 4 gallons of water. (Do not use soft soap with lead arsenate.) Lead arsenate may be combined with D.D.T.

### Red Mite (Red Spider)

Red mites or red spiders (*Tetranychus urticae*, Koch) attack various vegetables including tomatoes, artichokes, sweet corn, celery, cucumbers, marrows, onions, beans, peas, and egg





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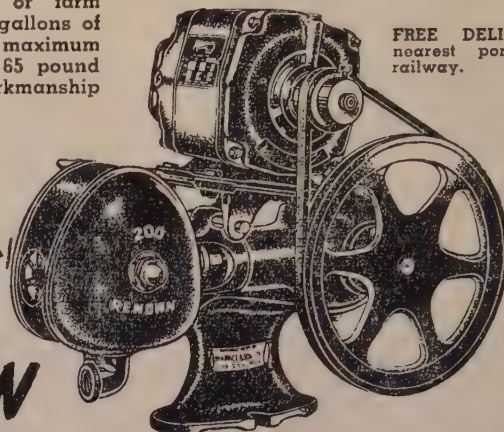
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# HYDATIDS is a KILLER!

Dogs are our faithful friends. Yet they can pass Hydatids on to humans and stock. To protect ourselves against this dread disease we must first protect our dogs

## HERE IS THE PICTURE:

Dogs do not grow the dangerous Hydatid cysts. They are only carriers of the Hydatid tapeworms. These they pick up mainly from eating raw offal. In their droppings, the dogs scatter the Hydatid tapeworm eggs, which as dust, are finally blown on to stock pastures; or adhere to the coats of dogs and so reach human hands. Thus, these in-

visible eggs, later to grow into cysts, reach the bloodstream, and thence to the liver, lungs, and even the heart and brain. In stock, Hydatid cysts result in the rejection of thousands of pounds worth of meat annually. Serious as the disease is, it can be stopped by these precautions.

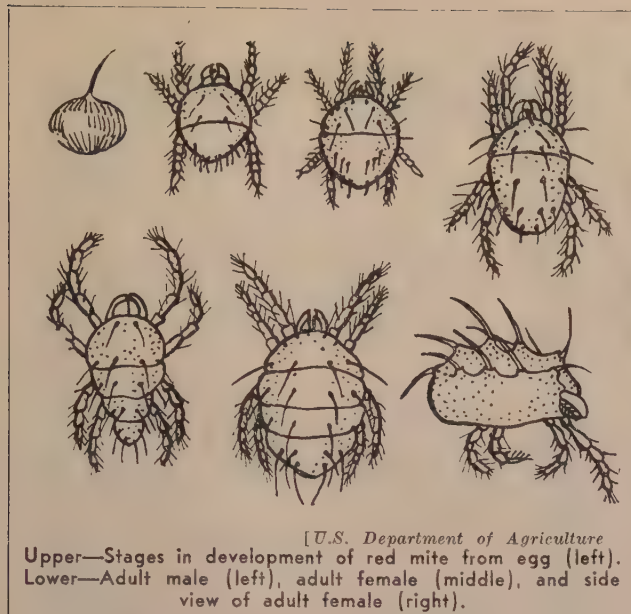
**FOR EVERYONE:** After handling animals, never put hand to mouth without washing. Take care children wash hands before every meal. Wash carefully all vegetables and fruit eaten raw.

**FOR DOG OWNERS:** Never throw raw liver or lungs of sheep to dogs. Cut offal into slices and boil first. Otherwise, burn or bury it. Dose your dog with a vermifuge every three months. For this, Arecoline is supplied with your dog license. Rid your dog of worms now! Then it is no longer a danger to you or to others.



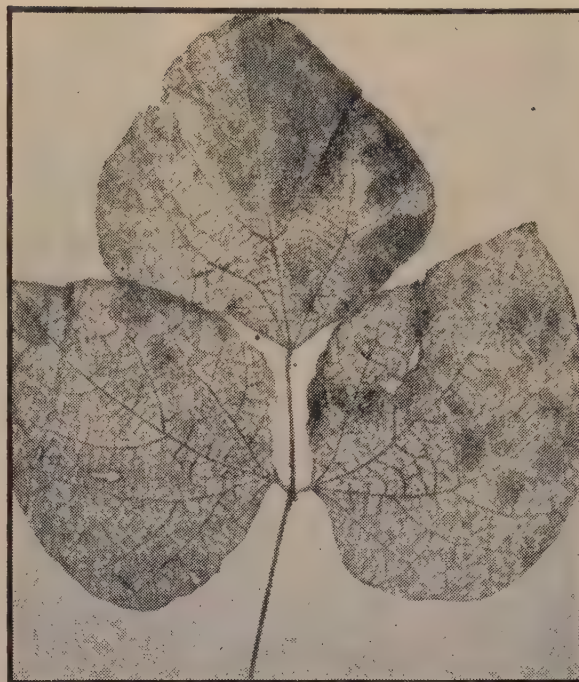
**Mr. FARMER . . .**  
 your co-operation, please.





[U.S. Department of Agriculture  
Upper—Stages in development of red mite from egg (left).  
Lower—Adult male (left), adult female (middle), and side  
view of adult female (right).

plants, strawberries, and a wide range of weeds. The adult mites are very small, ranging from 1/15 to 1/25in. long and therefore can be identified positively only with a magnifying glass. Their presence is indicated clearly, however, by the layer of webbing which they spin on the under sides of the leaves and by the typical damage to the leaves, which results in a "silvered" appearance. The mites rasp leaf surfaces and suck the exuding sap. Sometimes in summer the mites are pale yellowish or cream with a relatively large green spot on each side of the body.



[Sparrow  
Typical red mite damage on bean foliage, showing "silvered"  
appearance.

#### Control

Remove weeds, as the mites feed and multiply on many of them.

Spray with T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 2 teaspoons to 4 gallons of water or with H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at the rate of 4 teaspoons to 4 gallons of water.

Summer oil sprayed at 1/4 pint to 4 gallons of water or lime sulphur at 1/4 pint to 4 gallons of water also give good results.

#### Root Knot Eelworm

Different species of eelworms affect different plants, but most important to the home gardener is the root knot eelworm (*Heterodera marioni* Cornu), which affects tomatoes, cucumbers, lettuces, potatoes, parsnips, beans, carrots, and several others.

The adult eelworms (about 1/25in. long) are invisible to the unaided eye. They multiply rapidly and enter plant roots and stems, burrowing through the tissues, causing galls. They are more prevalent in lighter soils and at warmer temperatures, as in glasshouses, where they breed faster.

(The galls produced should not be confused with bacterial nodules of legumes (peas, etc.) or club root galls on cabbages and other crucifers.)

#### Control

In home garden glasshouses, soil sterilisation by steam or chemicals (such as chloropicrin and D.D.) will control eelworm. A more expensive and laborious method is to change the soil. Details of soil treatments are available from officers of the Horticulture Division.

Avoid growing susceptible crops in the same area for two successive years and practise crop rotation. Vegetables



Eelworm-infested tomato roots.

[R. W. Orr



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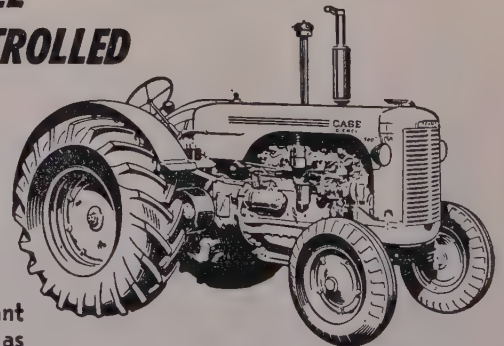
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tolerant of eelworm-infested soils are asparagus, onions, cabbages, cauliflower, celery, sweet corn, parsnips, radishes, rhubarb, spinach, and turnips.

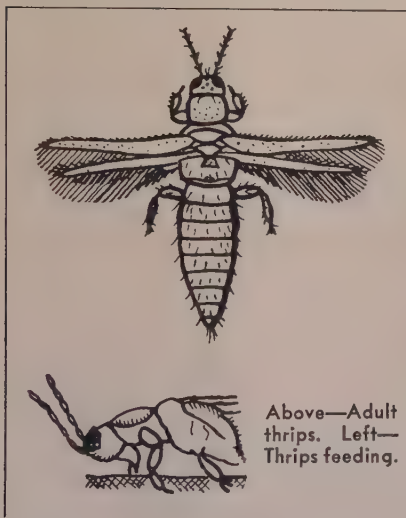
Weed control should be practised and old infested tomato and lettuce roots and stems should be burnt, as compost heaps increase eelworm populations and their distribution. Eelworms can also be spread to new soil by boots or implements from infested areas. Plants should be inspected for nodules and galls before being planted.

## Thrips

Thrips, of which there are several species, are small insects which cause damage to a wide range of plants, trees, and vegetables.

They are about 1/20in. long and yellowish brown to black, the lighter coloured being nymphs and the darker the fringed-winged adults. Thrips rasp the surfaces of leaves and fruits, causing corky or silvery areas, which are the typical signs of infection.

Vegetables attacked are tomatoes, cucumbers, beans, onions, squash, melons, turnips, and beet.



Above—Adult thrips. Left—Thrips feeding.

## Control

Nicotine sulphate at 8 teaspoons and summer oil 6½ fl. oz. to 4 gallons of water applied as a spray on sunny days is most effective.

Any of the following sprays also gives good control: H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at 5 teaspoons to 4 gallons of water; D.D.D. 25 per cent. wettable powder or D.D.T. 50 per cent. wettable powder at 3oz. to 4 gallons of water; T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 3 teaspoons to 4 gallons of water.

Two or three applications of one of the sprays at 14-day intervals should be sufficient to control thrips.

## Woodlice (Slaters)

The most common woodlice in New Zealand are *Porcellio scaber* Latreille.

Though woodlice (slaters) are mainly scavengers which feed on decaying vegetation, they also frequently nibble pieces out of stems, leaves, and roots, especially of young seedlings.

Woodlice are crustaceans not insects and have hard, grey, segmented bodies,



[Green and Hahn  
Typical adult woodlice.

which are convex above and flat below. They have two prominent antennae on the head and 7 pairs of legs. Woodlice reproduce rapidly, especially in warm, damp situations, producing numerous eggs, which are held on the under sides of the females' bodies until they hatch, usually in spring.

Compost bins, rubbish heaps, and other damp places where decaying vegetation is left are common habitats of slaters.

## Control

Clean cultivation and removal of rubbish, rotten wood, etc., are necessary to remove places of refuge for slaters.

D.D.T. 2 per cent. dust sprinkled in places infested with woodlice will give good control.

A poison bait of paris green, 1 part, and dried blood, 56 parts, sprinkled over the soil between plants at 1oz. per square yard gives fair control.

Alternatively the paris green bait described on page 263 may be used.

Commercial fly sprays containing pyrethrum and D.D.T. liquids will kill slaters instantly, but they should not be used near plants, because they may cause damage.

Boiling water poured on to colonies of slaters kills them instantly.

## Millepedes

Millepedes, of which there are several species, sometimes damage vegetables by feeding on roots or leaves close to the ground, especially in moist situations. Millepedes have rounded bodies (in cross section) and two pairs of legs to each body segment. They are slow moving and feed mainly on decaying vegetation. (Centipedes, often confused with millepedes, have more flattened bodies, one pair of legs to each body segment, are



[From "An Introduction to Entomology"  
Millepede. In some districts millepedes are common pests.

quicker in movement, and have long antennae on their heads.)

## Control

Clean cultivation to destroy feeding places such as damp rubbish, decaying vegetation, etc., is advisable.

Spray with nicotine sulphate 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added. Spray on hot, sunny days. Soak the ground well around infested areas. Alternatively spray with H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at 5 teaspoons to 4 gallons of water or with T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 3 teaspoons to 4 gallons of water.

## Green Vegetable Bug

The green vegetable bug (*Nezara viridula* L.) was dealt with in the section on pests of beans in last month's "Journal" (page 161).

## Aphides

Methods of controlling aphides generally were described in last month's "Journal" in the section on cucurbits (page 163).

## Birds

In some areas in spring when young plants and seedlings begin to grow birds become a serious pest to home gardeners. Though bird damage to plants can be serious, birds generally are the gardener's friends, as they destroy many harmful insects while feeding and usually do more good than harm.

Early spring, when young peas, lettuces, and other vegetables have germinated, is the worst time for bird damage, but the period does not last long. Birds attack young plants mainly because of lack of other food. Deterrents or scaring methods should be used rather than poisons, traps, or firearms to kill them.

Birds can be prevented from damaging home garden vegetables by using black cotton strung along rows or over beds, wire netting covers, or brightly coloured materials, bottles, or glittering metal strips strung over the garden. (See the March 1953 issue of the "Journal", pages 202 and 203.) Small amounts of food set out for birds and a constantly filled water dish for them will often discourage damage to vegetables and encourage insect hunting.

## Vermin

Home vegetable gardens on farms or distant from urban areas frequently are severely damaged by vermin (rabbits, opossums, rats, and mice). With vermin prevention is usually more effective than destruction.

The use of wire netting or closely boarded fences will prevent rabbits from entering gardens. Rats and mice can be poisoned or trapped, but the elimination of potential hideouts, such as old rubbish, wood piles, etc., can soon discourage them. Careful storing of pumpkins and potatoes in cool, airy places will reduce the chances of rats and mice from getting to them.

## Cats and Dogs

Carefully tended gardens are frequently damaged by cats and dogs.

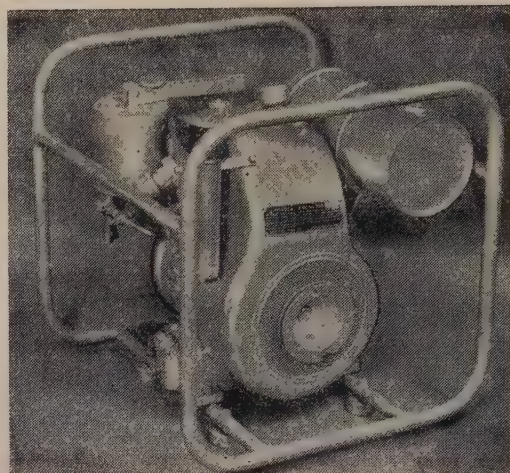




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Wire netting over seed-beds, stakes around plots, and spraying of strategic places with disinfectants or strong nicotine sulphate solution will act as deterrents.

## Important Points in Pest Control

Important points in pest control are:—

1. **Prevention is as important as control**, as destruction of breeding places, host plants, introduction of infested material, etc., can lead to increased damage by more varied pests as well as making the control measures more difficult and expensive.

2. **Identify the exact pest** causing the damage to plants; then:

3. **Use the correct spray at recommended strengths.** Use Government-certified spray materials where possible.

4. **Spray frequently, with complete coverage** until the pests are completely destroyed. One spray is usually not sufficient, as developing insects or eggs are frequently not all killed at one time.

5. **Spray with the correct concentrations** and make sure that the spray materials are thoroughly mixed to give full effect. Fine, dry weather is best for spraying most insects, as rain washes sprays off or dilutes them. Use good spraying equipment.

6. **Ensure that spray materials are always well labelled and kept in a safe place away from children.** Do not leave materials uncorked or without lids.

7. **Take necessary health precautions when using poisonous sprays.** The fumes of some sprays can be dangerous. Generally all certified spray materials can be used safely if precautions listed on containers are followed strictly.

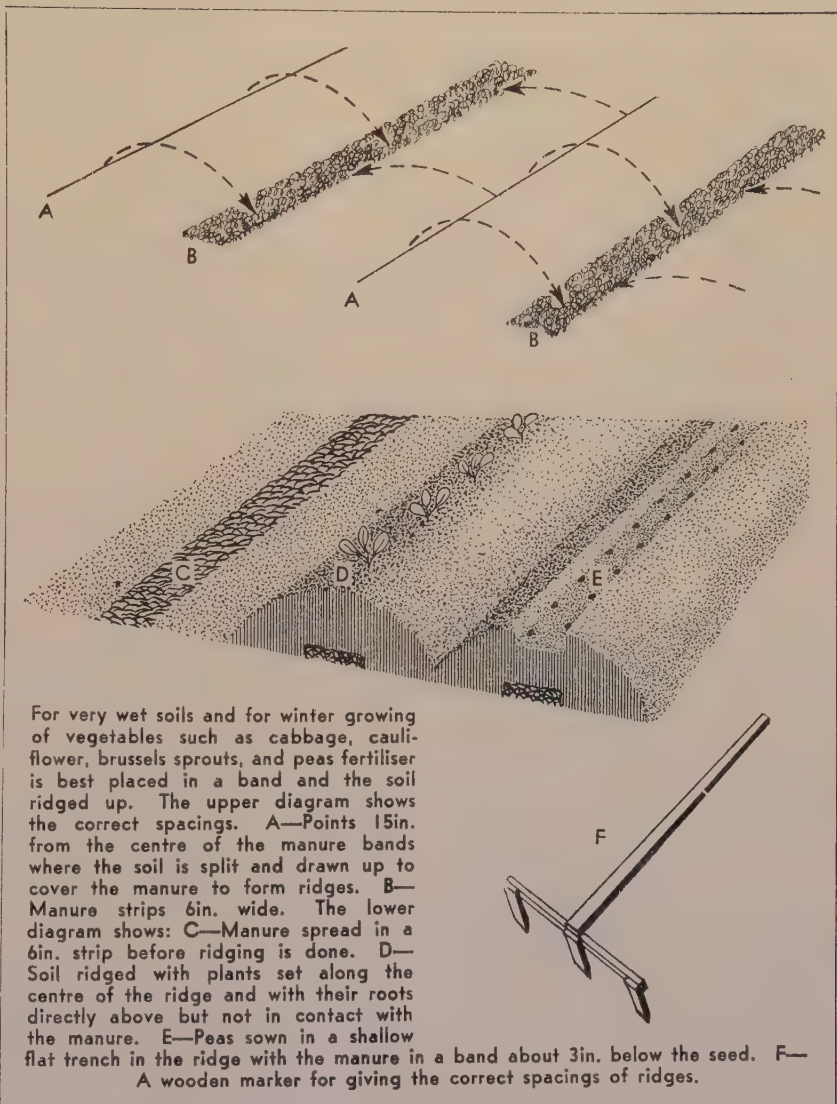
8. **Allow a reasonable period (3 weeks or more) between the last spraying of vegetables and harvesting,** especially with sprays which leave poisonous residues on vegetables. Where vegetables require spraying within a short period before harvesting sprays such as nicotine sulphate, H.E.T.P., and T.E.P.P. can be used, as their toxic effect disappears within a day or so after application.

## Acknowledgment

Acknowledgment is made to Dr. Cottier, Entomological Division, Department of Scientific and Industrial Research, for valuable help and suggestions in the compiling of this article.

## Work for April

At this time of the year day temperatures are usually still fairly high, but nights are cool and the growth of plants is slower. Seed sowing will be restricted to a few localities where the soil is well drained and the growing period extends well into winter. In most districts conditions are more favourable for planting than for sowing. Where crops are to grow through winter, sowings or plantings are best made on ridges or raised beds, as this will allow better



drainage and consequently higher soil temperature.

The hoe should be kept going between growing crops to suppress weeds and to aerate the soil and encourage growth of the plants.

Cauliflowers, broccoli, cabbages, and brussels sprouts which were set out on the flat earlier in the season should have the soil drawn up to them as they grow; this will help to support the plants and prevent them from being blown about by strong winds and will provide better drainage during winter. Leeks should be earthed up as they grow to blanch the stems, care being taken not to cover the heart leaves.

Kumara crops should be dug and stored. If crops are left in the ground too long after maturity, tubers tend to lose quality and may develop internal browning of the flesh.

In districts which experience early frosts crops of pumpkins, marrows, squash, and lemons, which are susceptible to frost damage, should be harvested.

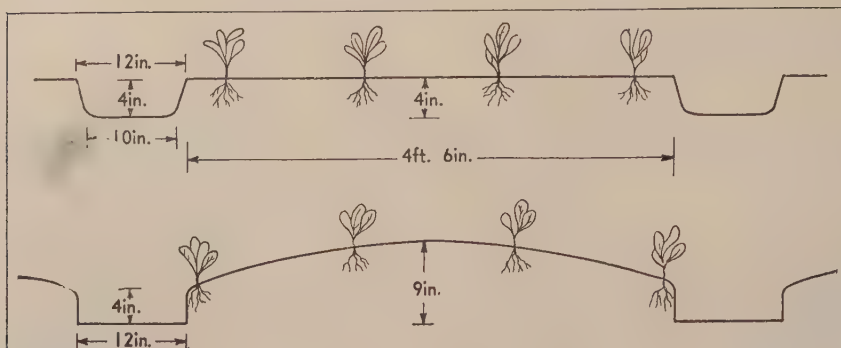
Tomato plants should be kept tied firmly to their supports so that they cannot become damaged by strong winds. Spraying of plants with Bordeaux mixture or a certified copper compound to protect them from blight should not be neglected.

At this period of the year most gardens have a considerable amount of refuse available for the compost heap and it may be advisable to start a new heap with all the fresh material rather than to add it to a partially matured heap. Maturing heaps should be turned periodically to hasten decomposition.

When crops are harvested the refuse should be removed and the plot dug over as soon as possible. If the land is not required during winter for a vegetable crop, it should be sown with a green crop, which will keep down weed growth and when fully grown should be dug into the soil to improve the humus content; it will also make the soil more friable and easier to work in spring.

Mustard or blue lupin is the most suitable green crop. The former is





The upper diagram shows the correct method of making raised beds suitable for winter growing of vegetable crops such as lettuce, celery, spinach, radish, carrots, beetroot, turnips, and spring onions or for growing them on wet soils. The area is first marked out, then the soil is taken from the pathways and spread evenly over the beds to raise their level. This operation is repeated until the number of beds required are formed. Final levelling is done with a rake. The lower diagram shows beds incorrectly made. The sides are too steep and are likely to fall in, the beds are too round on top, making them more subject to erosion, and the outer plants are set too close to the edge of the bed and have no room for development.

quick maturing, taking about 12 to 14 weeks to grow to a suitable size. Blue lupin requires about 20 weeks to reach the flowering stage. It is at this stage that the nodules which form on the roots of the plants and contain nitrogenous material are usually largest. Therefore the greatest benefit is derived if the plants are allowed to grow to the flowering stage before being dug in. In exposed positions lupin if sown in drills at intervals throughout the garden can be used to provide shelter for winter and spring crops.

Fern growth of asparagus should be cut and burnt as soon as it has turned yellow. It should be cut off 2 in. above the ground (hedge shears are excellent for this purpose) and the bed weeded and tidied up. Now is a good time to increase the depth of soil over the crowns and to improve the humus content of the soil by applying a light dressing of compost or clean soil mixed with well-rotted farmyard or poultry manure.

Rhubarb beds should be kept free from weeds. Winter-producing varieties of rhubarb will benefit from a dressing of equal parts by weight of blood and bone and superphosphate applied at the rate of  $\frac{1}{2}$  lb. a square yard and lightly forked into the soil.

### Storage of Vegetables

Many vegetables maturing in autumn can be stored. In areas where early frosts are likely tomatoes can be picked and the immature fruits made into jam, chutney, or pickle. More mature, sound fruits may be placed in single layers in shallow boxes. The bottoms of the boxes should be covered with slightly damp sawdust, which is also used to cover the fruits, and boxes may be placed one on top of the other. Such tomatoes, if kept in an ordinary kitchen temperature, will ripen. The fruit should be examined once a week, when any showing signs of decay should be removed.

Pumpkins and squash when harvested should first be cured in the sun for about 10 days before being stored in a well-ventilated, dry place. They should be placed on their edges in a single layer.

Kumaras after being dug should be thoroughly dried in the sun for a day. Only sound ones should be kept for long storage. They should be either wrapped in paper or placed in dry sawdust in a box and stored in a dry shed. Root crops such as parsnips and carrots are best left in the ground, if garden space permits, unless the soil

becomes very wet. In the South Island root crops store well, but in most parts of the North Island, because of relatively high winter temperatures, they do not keep well in storage. Carrots and parsnips store best in slightly moist sand.

Swedes and beetroot store well in an open shed where conditions are cool but not too dry. They may be placed in a small compact heap and covered with hay or straw to reduce the rate of moisture loss.

Potatoes store well in boxes placed in a cool, dry shed. If the potato tuber moth is troublesome, tubers should be dusted with a 2 per cent. D.D.T. dusting powder at 10z. of powder to 28lb. of tubers.

### Sowings

**Onions:** Where it is desired to produce onion plants for transplanting in spring, or where plants are to be left in the seed-bed to produce an early crop for use as green onions, seed may be sown late in April or in May. In the North Island most onion crops grown for storing are transplanted in spring from seeds sown this month, but in the South Island, because of severe winter conditions, seed is not sown until spring and is then sown directly in the field. Recommended varieties are Pukekohe Long Keeper and Straw Spanish.

**Spinach:** In well-drained soil in districts where autumn conditions are not too severe a sowing early in April should be successful. A good winter variety is Large Leafed Prickly.

### Plantings

**Cabbages:** In districts where the winter is not too severe plants to mature in early spring may be set out now in well-manured soil. They are best planted on ridges. Suitable varieties are Enfield Market, Golden Acre, Hendersons Succession, and savoy types.

**Cauliflowers and broccoli:** Plants can be set out in all areas except the far southern districts. Recommended varieties are Phenomenal (5 months), Phenomenal (6 months), Roscoff No. 2, and Walcheren.

**Lettuce:** Plants can still be set out in the warmer districts, but to obtain all possible warmth raised beds should be made. Good winter varieties are Neapolitan and Triumph.

### Show Dates

THE following are the dates and venues of A. and P. shows:—

- \*3 April—Methven A. and P. at Methven.
- 3 April—Oxford A. and P. at Oxford.
- \*10 April—Malvern A. and P. at Sheffield.
- \*19 April—Mackenzie County A. and P. at Fairlie.
- 19 April—Strath-Taieri A. and P. at Middlemarch.
- Winter Shows**
- \*15, 16, 17, 18, and 19 June—Taranaki Metropolitan A. and P. Society at New Plymouth.
- 17, 18, and 19 June—Te Kuiti and District at Te Kuiti.
- \* The Department of Agriculture exhibit will be staged at this show.

EDITOR: PETER MACKINTOSH

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3. The Close-Folding of Dairy Cows: Part II
4. Management and Manuring for Seed Production in Cocksfoot and Timothy
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# Foot-rot Elimination is a Major Project

**F**OOT-ROT in sheep is a major problem on any farm where the disease occurs, and the economic effects are very serious. On many farms the amount of work devoted to foot-rot treatment every year is very considerable, but because this work is not done efficiently it recurs from year to year and is never ending. Foot-rot seriously affects the health of sheep, the severe lameness being only a minor aspect when compared with many other troubles which accrue as a result of the disease. In ewes "sleepy sickness" is accentuated when a check has occurred as a result of bad feet; a lame, unhealthy ewe cannot produce and adequately feed good lambs. Lame lambs do not thrive, and rams with foot-rot can be definite liabilities. This disease can be eradicated from the majority of farms where it is prevalent, but any farmer who contemplates an eradication project must plan to give the large amount of work involved precedence over other current farming operations. Once a project is begun there must be no deviation from the programme planned until the operation is completed. In this article C. A. Martin, Livestock Instructor, Department of Agriculture, Tapanui, describes how such a project was successfully carried out.

**I**N West Otago a full-scale foot-rot elimination project has recently been put into effect on the property of Mr. D. D. Alderton, of Greenvale. This farmer runs approximately 1800 sheep of Romney cross type on 585 acres of good rolling sheep country, and over the years foot-rot has cost him considerable time, work, and loss.

## Proper Facilities Essential

Before any foot-rot eradication scheme can be planned the farmer must have the facilities and the equipment to do the job satisfactorily. Mr. Alderton had excellent facilities. He had just completed a new shearing shed in the interior of which a race or grating was included which was easily accessible to sheep. It led into a foot-rotting cradle in which the sheep could be turned on to their backs. After sheep were dealt with in the cradle they continued on into a foot-rot bath at the end of which was a drafting gate which enabled affected sheep to be separated from those which were sound. The importance of good facilities cannot be overstressed, and the provision of these under cover is well worth consideration, as foot-rot operations can be continued indoors when wet, cold weather would make it impossible to work in open yards.

The equipment required is primarily a good sharp knife, good foot-rot shears, sufficient bluestone, and raddle for marking affected sheep.

## Early Planning Important

Early planning is of paramount importance. The ideal time for any

foot-rot elimination project to be begun is in early autumn, principally because after dry summer weather foot-rot in any flock is at its lowest ebb. The main planning involves having all sheep in paddocks from which they can be taken to the site of operations without traversing ground over which healthy sheep after treatment will have to travel when being put out into paddocks which have been "cleaned" by spelling for at least 7 days. The feed available in all paddocks is an important consideration at this stage.

On Mr. Alderton's farm all sheep entered the shed at one entrance and all healthy sheep left the shed by one exit and traversed clean ground en route to clean spelled paddocks. All affected sheep were drafted from the healthy ones at the end of the foot bath and taken via a third doorway to hospital paddocks which had been established as part of the planning. At this time of the year rams must be kept strictly by themselves, and this involved planning for three additional small paddocks—one to hold rams before the operation, one clean to receive clean rams, and a ram hospital paddock. The actual operations involved doing the rams first and then taking the clean rams to their paddock first via the exit that was later used for all affected sheep. The plan on page 276 indicates all sheep movements. The layout was prepared months before the project was begun.

## Feed Arrangements

An important point arose concerning the feeding of untreated sheep in their "dirty" paddocks. It was found that it took a great deal longer than was expected to do the foot-rot eradication thoroughly, with the result that there was a danger of untreated sheep having to be held too long with inadequate feed. This indicates that planning must make provision for ample feed and that it would be



This pocket would have been a carrier if careful paring had not exposed it.

dangerous to under-estimate the time it would take to complete the job. It is also important to make a reasonably accurate estimate of the numbers of sheep affected so that large enough hospital paddocks can be provided. Another vital matter is the estimation of the rate at which sheep will be put through. It was found on this project that a good operator working under good conditions and with a small percentage of sheep with bad feet may handle 150 sheep per day, but with approximately 20 per cent. of sheep affected 100 sheep per man was a very good figure. Sheep must be well contained in their respective paddocks, as it would be disastrous for a dirty sheep, because of lack of food, to force its way through a poor fence into a paddock containing clean sheep. All these factors have a direct bearing on the feeding of the sheep during the time required for the project.

## Great Care Essential

Every digit of every foot of every sheep on Mr. Alderton's property was examined; the majority were pared and those which required attention were treated. Foot-rotting is an art, and unless the sheep's feet are pared back as nearly as possible to their natural shape and unless all underrun

## Mixtures to Use in the Foot-rot Bath

### For Foot-rot Affected Sheep—

Bluestone: 3lb. to 1 gallon of water.

Formalin: 10 gallons to 100 gallons of water.

### For Routine Prevention—

Bluestone: 1lb. to 1 gallon of water.

Formalin: 2 gallons to 100 gallons of water.

Note: 16 sq. ft. x 3in. deep holds 25 gallons.

## The Four Essentials for Eradication

1. Remove foot-rot cases from the flock.
2. Send clean sheep to paddocks which have been free of stock for at least 1 week.
3. Treat affected sheep until they are cured or cull them.
4. Isolate and treat introduced sheep until they are free from foot-rot.



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horn is removed to expose all diseased tissue, cures will be slow. It is most important to be particularly careful with diseased feet the first time sheep go through the shed, as a quick reduction in the number of sheep in the hospital paddock next time through is essential, or feed difficulties will arise there. This is vital only in the early stages, as later on paddocks which had held dirty sheep and had had time to become clean could be used to good effect rotationally as hospital paddocks.

Feet with a large amount of gnarled horn but still more or less in their correct shape should be regarded with suspicion. In this project it was often found that when this type of foot was severely pared a deep pocket of serious infection was found. Nature appears to provide this thick, hardened horn as a protection for a tender foot. Sheep walk soundly on such feet, do not show distress, and could be dangerous carriers of the disease. The most reliable guide to a suspicious foot was by feel; the pastern and foot should feel cool. A hot, dry foot which is normal in appearance should be well pared and thoroughly inspected, as heat almost invariably indicates trouble.

In the paring of feet every care must be taken not to be unnecessarily severe, but all diseased tissue must be exposed so that the bluestone can be effective. Care is particularly necessary near the point of the toe, where the toe vein is not very deep seated, as during the project cut toe veins which bled profusely gave rise later to proud flesh at the points of the toes and healing was slow and treatment troublesome.

### Advantages of Cradle

Farmers with a considerable number of heavy sheep to handle would be well advised to purchase a foot-rotting cradle. A cradle erected in the woolshed with a good approach race and ramp and with the exit into a foot-rot bath has proved ideal on Mr. Alderton's property. The advantages of being able to do this work indoors are considerable; wet weather or wet



Untrimmed (left) and trimmed hooves. All suspected hooves should be well pared and thoroughly inspected.

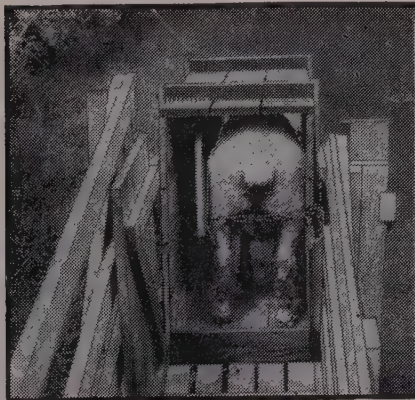
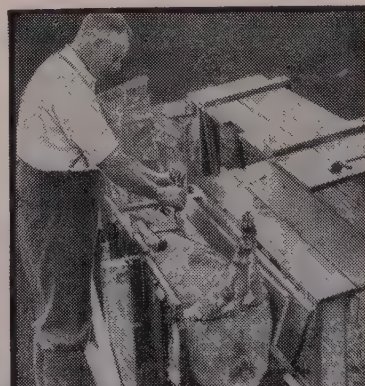
sheep do not stop or curtail operations and the feet of wet sheep or of sheep off wet ground are soft and easy to pare, which makes the paring more accurate and the whole job easier. Foot-rotting under ordinary conditions is arduous and back-breaking, which does not lead to efficiency, but with a cradle indoors an operator can work longer hours efficiently with less fatigue. When work is being done inside good lighting is an important matter. In Mr. Alderton's shed the cradle was erected adjacent to a large glass window, and additional, artificial lighting was available right over the site of operations.

### Treatment Method

In this particular project work began on Thursday 9 April, and until Wednesday 22 April, during which time 1800 sheep were dealt with, the operation was given precedence over all other farm work. After careful examination and paring all sheep were put through a trough containing a 10 per cent. solution of bluestone. At all times when the sheep were put through the foot-rot bath they were

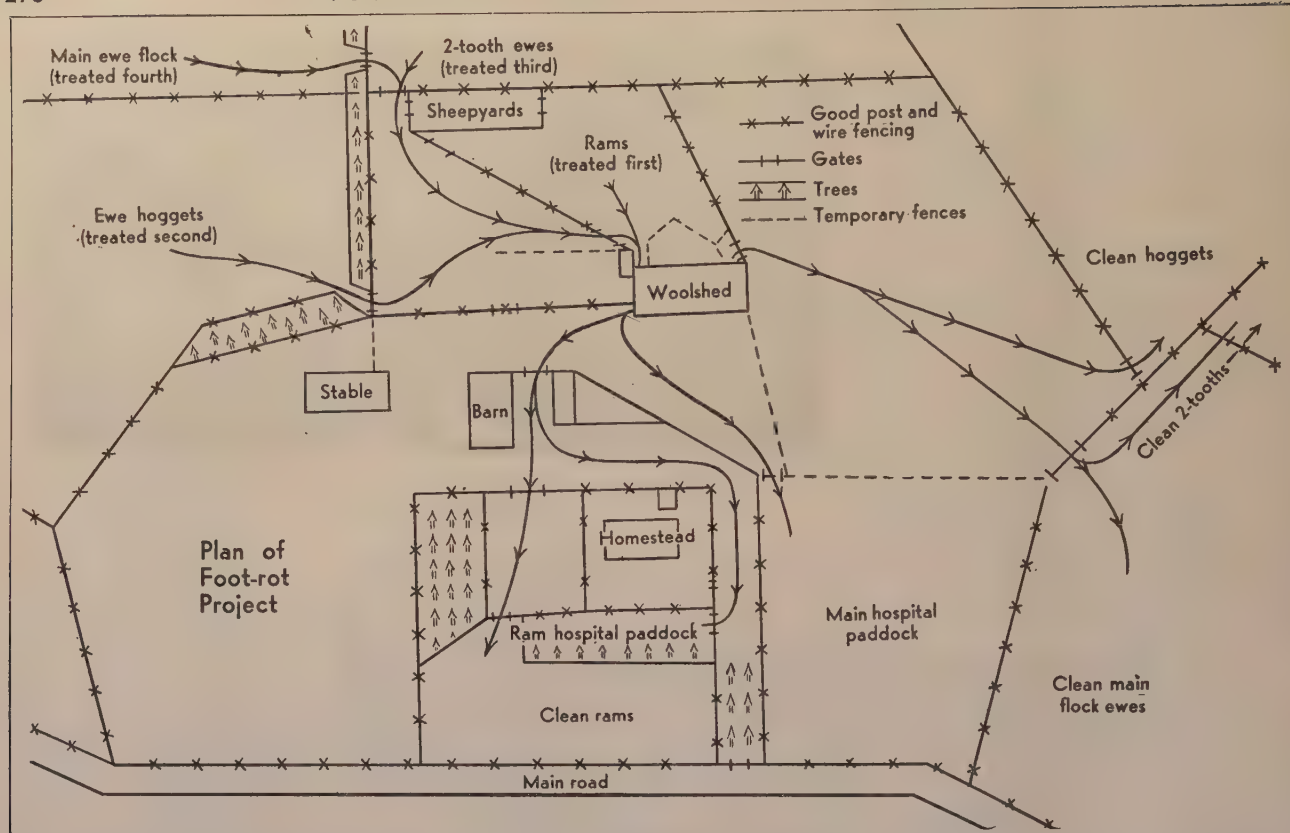
held in the bluestone for at least 1 minute and then held on the grating for approximately an hour before they were put out to their paddocks. Any affected sheep or any having the slightest suspicion of foot-rot were marked with raddle and drafted off at the exit from the foot-rot bath. In this manner 197 sheep were separated from the remainder of the flock; that is, approximately 11 per cent. of the flock was affected with foot-rot. Fifteen out of 30 rams were affected, 30 out of 400 ewe hoggets, and 152 out of approximately 1400 ewes. These 197 affected sheep were confined to the hospital paddocks and on Tuesday 28

A foot-rotting cradle is advantageous to farmers with large numbers of heavy sheep to handle. The cradle illustrated below and at right is identical with that used by Mr. Alderton, though his has been built inside the woolshed. Below left—A sheep secured in the box. Below middle—The box being turned over to bring the sheep into position for foot paring. Below right—Opening the box. At right—Trimming the feet.





## FOOT-ROT ELIMINATION IS A MAJOR PROJECT



April were all brought back into the shed; after being carefully examined and if necessary treated they were put through a 30 per cent. solution of bluestone. The success of the initial paring and treatment was now apparent, as of the 197 affected sheep, 130 were classed as cured and put into an intermediate paddock. Sheep which had had foot-rot and had been cured were not returned direct to their respective mobs because of the possibility of the cure not being complete. Sixty-seven sheep which still showed signs of foot-rot were returned to a fresh hospital paddock.

On Wednesday 6 May the 130 sheep were brought in from the intermediate paddock, examined, and put through the bluestone bath; 1 which had had a very bad foot did not appear to be cured and was kept out to be sent to the freezing works. The 67 uncured sheep were brought in from the hospital paddocks, examined and treated, and put through a 30 per cent. solution of bluestone. On this occasion 33 sheep were classed as cured and put into an intermediate paddock; 34 were considered to have foot-rot still, and 4 of these and the one uncured sheep from the other group, all being classed as incurable, were sent to the freezing works. Thirty sheep were thus retained in hospital paddocks.

On Tuesday 12 May all sheep from the intermediate paddock were examined and put through bluestone, and as all were considered cured, they were returned to their respective mobs. From this stage sheep in the intermediate paddock were retained there for a period of observation; they were then examined, put through

bluestone finally, and if cured returned to their respective mobs. Thirty sheep from the hospital paddock were again put through the cradle; 14 were classed as cured and after the usual treatment were put into an intermediate paddock. Sixteen sheep, all ewes, were not cured, 6 of these were put through the bath, and the other 10, which were affected mainly with exposed proud flesh at the toes brought about chiefly by severely cut toe veins, were dressed with a proprietary foot-rot paste containing bluestone and bandaged. The 16 sheep were then placed in a hospital paddock.

On Tuesday 19 May 5 sheep were returned from the intermediate paddock to the hospital paddock because of incomplete cures. Twenty-one sheep required examination and treatment that day. The feet of the 10 bandaged sheep were soft enough to pare easily, and after the feet were pared the sheep were put through the 30 per cent. bluestone solution; for the next 4 days they were held and fed in the shed on the grating. The other 11 sheep were classed as cured and entered an intermediate paddock.

On Tuesday 26 May the 10 remaining sheep were put through the treatment procedure; 6 were definitely cured and 4 were held for further treatment. These 4 all had proud flesh protruding through the horn of the hoof at the toes and were subsequently cured with bluestone. On this date, approximately 6 weeks after the project was begun, for the first time no foot-rot was observed and the elimination project was at an end.

This description indicates the tremendous amount of time, labour, diligence, and perseverance that is essen-

tial if any such project is to be carried out effectively. This programme, which lasted 6 weeks, entailed approximately 264 man-hours of actual work.

At all times since the project was completed a close watch has been maintained for lame sheep, and over 6 months 5 ewes which did show signs of what could be deep-seated foot-rot were isolated from the flock and not returned until cured. Some of these sheep may have been affected with foot abscess. It is difficult to say whether foot-rot has been eliminated from this flock of 1800 sheep, but already outstanding results have accrued from the work done. In comparison with the work already done any further work necessary for the elimination of foot-rot will be easy. One hundred and ninety-seven sheep affected with foot-rot in April would have resulted in many more unsound, lame sheep after a winter during which they were confined to small turnip breaks where conditions were ideal for the spread of the disease.

Pregnant ewes affected with foot-rot are prone to "sleepy sickness" and many other troubles; they are poor mothers, so that their lambs are poor and often die of malnutrition. Affected rams are a liability. All sheep affected are troublesome to move during any operation. The work done on Mr. Alderton's farm has corrected these complaints and has eliminated the great amount of trouble and work that must result in having lame sheep in any flock. A foot-rot eradication project is well worth while, for apart from its real benefits, any farmer who by his own steadfast labours eliminates foot-rot from his flock must experience a great deal of satisfaction.





# Trellises and Pergolas in Flower Garden

**T**RELLIS can be used in many ways as a protection for garden crops and in enhancing the beauty of homes and gardens. The types or designs of trellis vary from the protective fence and the overhead supporting trellis for growing crops to the ornamental pergola clothed with suitable climbing plants which adds beauty to the garden and gives a welcome coolness and shade in the heat of summer. Uses for trellis and pergolas are discussed in the following article by G. J. Hicks, Horticultural Inspector, Department of Agriculture, Christchurch. Flower garden work for April is dealt with by H. P. Thomas, formerly Horticultural Instructor, Department of Agriculture, Wanganui.

**I**N a garden there are many ways of forming a screen, of which the most common are hedges, fences, and trellises. Hedges consist of living plants, either trees or shrubs trained in various ways. A drawback common to all hedges is their impoverishment of the soil. If a hedge is to continue to grow vigorously, it must be fed with manure regularly and be given one or more trimmings each year. Closed-type fences such as brick or paling fences have the disadvantage of producing a pocket of dead air where pests survive the winter. On the other hand, trellis gives shelter with none of the drawbacks common to hedges or closed fences.

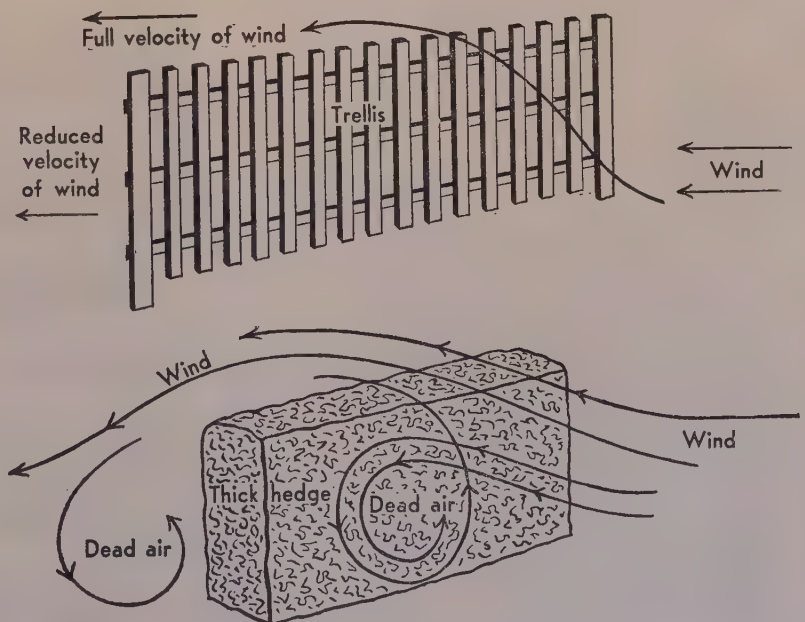
Trellis is a structure or frame of cross-barred lattice work used for screens, doors, windows, fences, espaliers, or pergolas. An espalier has horizontal bars only. A pergola is an arbour, usually a covered walk with

climbing plants trained over posts and cross-pieces. Even the picket fence could be covered by the term "trellis."

## Effect of Batten Spacing

Trellis gives better shelter than hedges for several reasons. The space between the battens permits air to flow, thus checking the development

of a frost pocket. The size of the spaces governs to some extent the speed at which the wind passes through, and reduces the wind flowing over the top in the form of a wave to damage crops on the other side of the trellis fence. Thin hedges have a similar effect. The shelter from thick hedges is not so useful as is shown in the diagram on this page. When wind



Comparison of wind currents against a trellis fence and against a hedge.

**HEADING PHOTOGRAPH:** Wooden trellis successfully used in a brick fence to provide beauty, support for plants, and shelter.



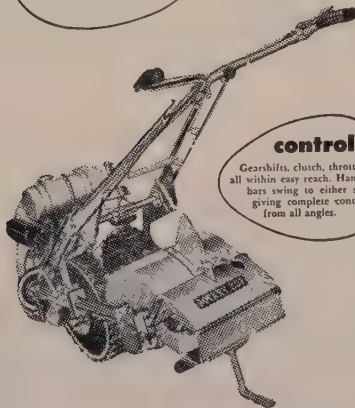
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strikes a trellis fence it passes through at a slower speed. The eddies of wind formed by striking the battens of trellis soften the force of the wind passing through the gaps. For shelter purposes, the battens should not be spaced too wide apart, as the strength of the wind would not be sufficiently reduced. On the other hand, close spacing gives the effect similar to a thick hedge.

Trellis assists the health and hygiene of plants. Not only is the free movement of air at moderate speed facilitated but also light and heat are affected. Sweet peas and roses growing against a closed paling fence have been found to be heavily attacked by mildew, whereas those growing by a trellis fence have been relatively free and gave a larger crop of blooms. The moderate shade of trellis enables plants to be grown in close proximity on both sides of the fence, even on the south aspect.

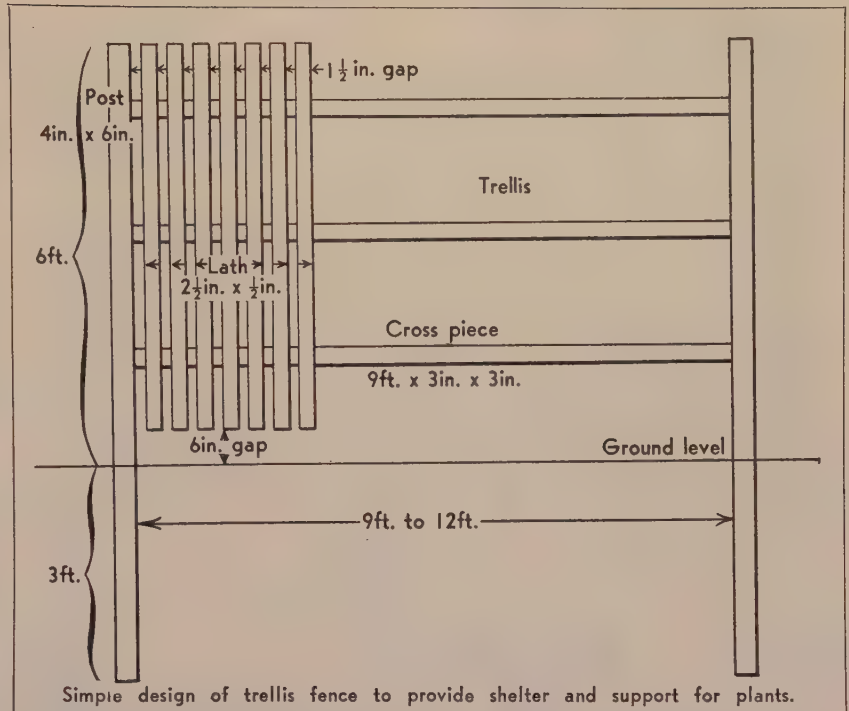
### Screening Effect of Trellis

Perhaps more trellis is used for screens than for the support of plants in New Zealand gardens. The intensity and frequency of the winds and also their coldness in some districts have made the erection of shelter imperative. Some commercial flower growers on the hills near Christchurch have erected trellis fences of a simple pattern to provide shelter. One design consists of three horizontal cross-bars attached to posts of 4in. x 6in. timber 9ft. long. The cross-bars are 3in. x 3in. by 9ft. to 12ft. long and are spaced 18in. apart on the uprights. To these are nailed battens 2½in. x ½in. x 5ft. 6in. spaced 1½in. apart. A space of 4in. to 6in. beneath the battens is allowed for clearance off the ground, as is shown in the upper diagram on this page.

This pattern intensifies the impression of height and narrowness of the area of land; if the battens are placed horizontally on the supports, the impression of spaciousness is increased. Rose growers may find a batten spacing 2in. to 2½in. or more in sheltered positions of greater benefit in letting additional light and heat pass through. Among gardeners the square and diamond patterns of trellis are popular. The diamond pattern of expanding trellis was very popular in a past generation and still has its advocates today. The square pattern finds more general acceptance, for it harmonises better with lines of buildings, particularly on small properties.

Trellis lines are softened by plants such as espaliers of *Cydonia japonica*, *Forsythia intermedia* var. *spectabilis*, *Cotoneaster microphylla*, or climbing plants like *Clematis montana* and *Wistaria sinensis*.

A trellis of brick will provide a more durable structure than wood or metal. There are many patterns, of which a simple one is shown in the diagram at right. Some of these holes may be filled with soil in which to grow such hardy plants as cheiranthus (wallflower), mesembryanthemum, and *Polypodium vulgare* (hardy fern). The stems of trees, shrubs, and climbers may be attached to the wall, but should not be allowed to go through the openings. The majority of the holes in the wall should be left open and free of covering foliage so



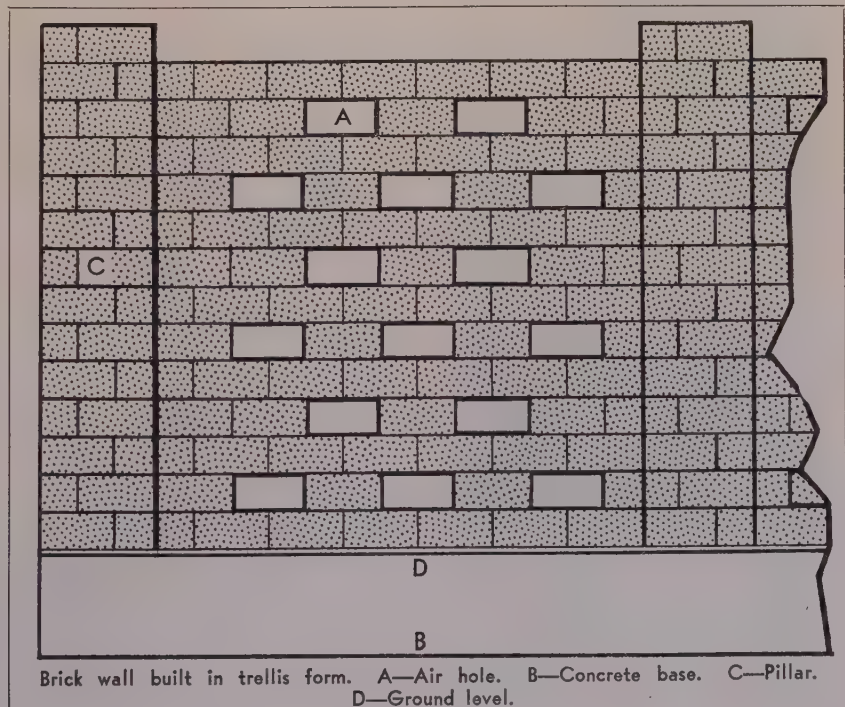
that they function effectively in letting a flow of air, heat, and light pass unhindered. This encourages better growth of plants on either side. It is a type of wall to be preferred to a solid brick wall, which, though it gives privacy, is ill-suited to trained plants, because of the side and rebound thrusts of the wind.

### Trellis-topped Structures

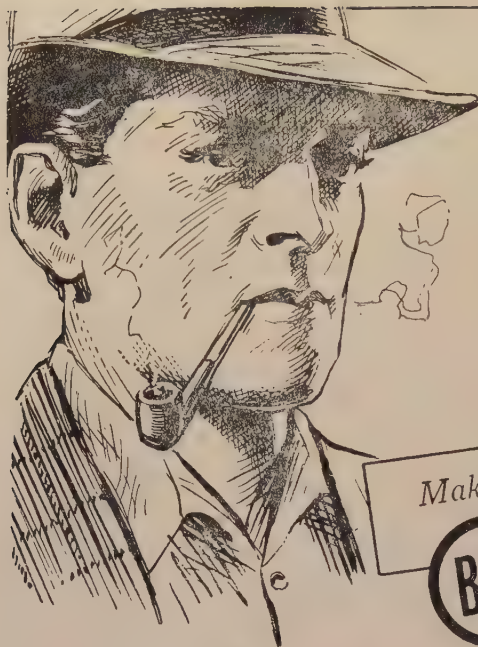
Many fences constructed of iron or wood are topped with trellis to extend

the height and to provide places suitable for covering with climbers. If the northerly aspect of such a trellis is subject to sunshine roses will be found useful in covering the fence. This combination of plants and trellis makes a fine background for a rose bed or herbaceous border.

Trellis may be fitted between the pillars of a brick fence as shown in the illustration at the top of page 277. The wall may consist of plain brick topped by a layer of hewn brick to







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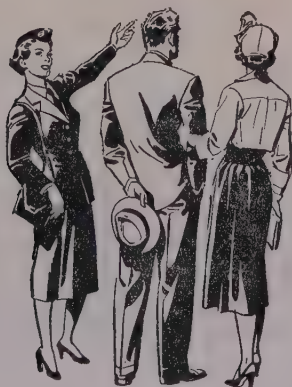
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blend with the hewn outer surface of bricks which form the 5ft.-tall pillars. The brick wall rises 2ft. and the trellis carries the screen up another 2ft. Where support for plants is of prime importance the trellis squares may be 5in. to 6in. A covering of clear varnish to brick work makes the surface more attractive. With the brick work dark red and the trellis dark green with *Rhus typhina* (stag sumach) and *Clematis montana* in each 12ft.-wide bay a pleasing harmony of colour is made.

### Trellis Divisions

Trellis divisions between houses are often exposed to strong draughts and subject to too much shade for the successful establishment against them of many plants and in particular roses. For such a position *Clematis montana* and its varieties, *Clematis tangutica*, *Cotoneaster microphylla*, and ivy have proved suitable. If the lower parts of clematis become bare of leaves, the planting of hydrangeas or similar leafy shrubs will supply cover at this level.

Trellis may find a place in design in the garden, dividing an area into sections each used for a different purpose. Small housing sections may have a greater need of this. It is often used to hide the vegetable garden, which at certain times of the year is not attractive. The shelter and seclusion provided by trellis divisions assist in allowing several different types of gardens in a small area. For example, a section may comprise a lawn with a comfortable garden seat and surrounded by a 4ft.-wide mixed flower border with a background of espalier trained shrubs. Another section may consist of a lawn leading up to a rock garden set in a background of hardy ferns, lilies, and flowering shrubs. When trellis is used for divisions in a small area caution should be exercised to see that the subdivisions created are not too small. Two skilfully made divisions are better, with two enjoyable designs of gardens, rather than three or four divisions with designs spoilt through lack of sufficient room.

### Trellis Gate

Solid gates give absolute privacy, whereas a lattice gate gives partial privacy. A lattice gate with 1in. or 2in. between battens supported on a well braced framework makes an effective barrier. It permits a flow of air, heat, and light to pass through gently to dry a path on a southerly aspect, whereas a path behind a solid gate with such an aspect in cold, damp climates during winter is often wet and frosty for several days at a time. A lattice gate permits a glimpse of a display. To see half-screened the bright leaves of a golden privet and the rosy red flowers of *rhododendron arboreus* stimulates interest in the garden beyond.

### PERGOLAS

The pergola is a structure for supporting plants which provide welcome shade over a path or drive-way.

The overhead trellis for a pergola may take the form of cross-beams of wood or combinations of steel wires and wood; or it may be of masonry and wood or of steel forming a framework to support climbing plants. Plants may combine usefulness with beauty, for example, Chinese gooseberry, passion fruit, or hardy grape;



A solid brick wall which is excellent for giving privacy, but which is not so suitable for growing plants against.

for example, Black Hamburg, Albany Surprise, or Chasselas Dore Salomon (white).

### Concrete or Stone Pillars

Graceful concrete or stone pillars rounded or squared and supporting thick beams of jarrah, with cross-beams boldly spaced, give a pergola an impressive appearance. Rounded pillars bring a Grecian touch into the garden and add contrast. Wooden uprights, though less costly in erection, are more subject to deterioration by weather and are not so aesthetic. Pillars should not be lower than 8ft. or 9ft., though 9ft. is better, as more space is provided for climbing plants to hang down in festoons. Pillars of 9ft. should have a diameter of 12in. to 24in. A wider diameter is preferable, as more support is given a fully clothed pergola to withstand the wind. If the columns are too low, a cramped feeling will result. It is better to have it higher than is necessary, as this builds up the impression of grandeur.

### The Lintel and Rafter

The lintels or beams, which run parallel to the path, if made of wood, should be 3in. to 4in. by 8in. to 9in. in thickness and width. Reinforced concrete of suitable thickness could be used to provide a more durable structure. Lintels should be 12ft. to 14ft. long with a path width of 6ft. to 7ft. This spacing lets through sufficient sunshine to brighten and dry the path. Closer spacing would provide a thicker canopy, making the path and bordering beds damper and more shaded for growing hardy ferns, etc.

To protect the wooden beams from weather some gardeners prefer boiled linseed oil to give a protection and to bring out the colour and grain of the wood. If cream or white stone is used for the pillars, cream or white paint on the wooden upper structure would provide a blend. Shades of green are used often to make the garden structures less obvious when the plants are leafless. Climbers that have been on pergolas and trellis for some years are often difficult to remove when it is required to paint the structures. To

preserve the wood oil will be found easier to apply. Should the oil get on the vines, it is not as unsightly as paint.

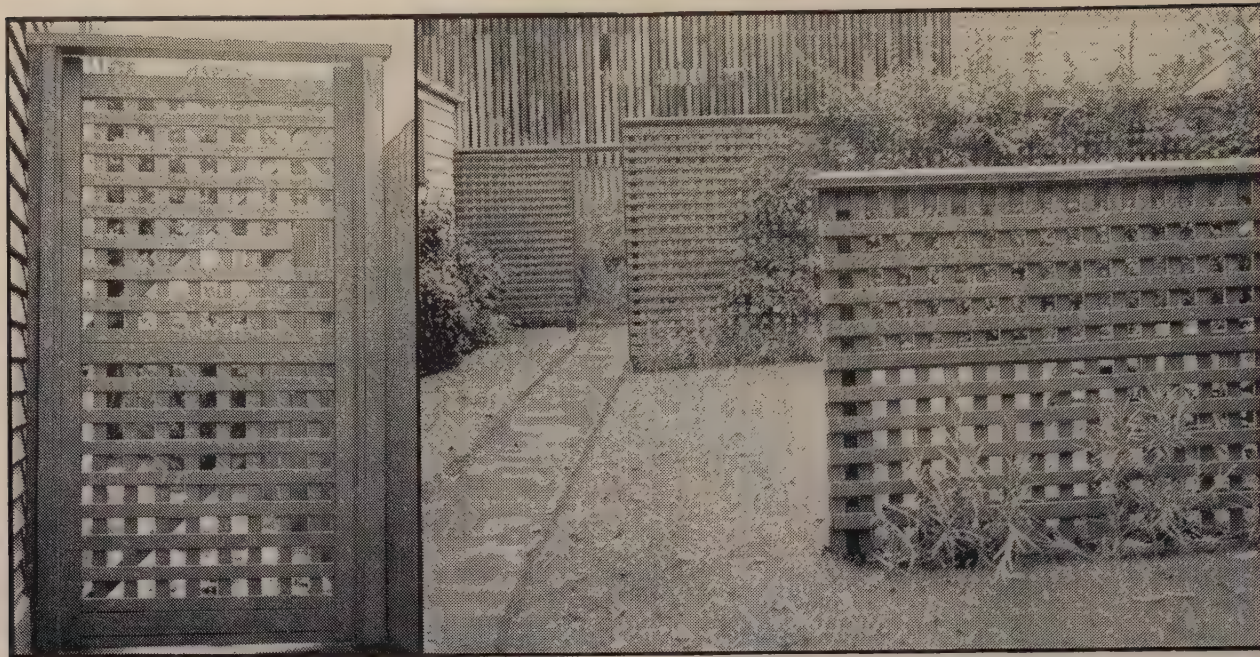
### Pavement

Well-kept gravel paths are the best in a garden and are used in pergola work, but they require more maintenance than those of concrete or asphalt. Brick, slate, and stone paths provide



*Clematis montana* clothes a trellis-topped fence in a shady, draughty position.





Left—A trellis gate makes a fine barrier between two gardens. Right—Trellis is useful for dividing an area into sections.

variety. Turf is not satisfactory for a much used path, especially in wet weather. A camber 1in. high in a 10ft.-wide path is satisfactory to shed surface water.

### Suitable Plants

For clothing lintels and rafters of pergolas strong vigorous plants are required. On a permanent structure of masonry ivy would be suitable. The common green ivy is *Hedera helix*. It grows quickly and makes an effective cover. A more interesting variety is *Hedera helix elegantissima* (or *H. tricolor*), which has small green leaves with silver-white margins and a faint pink flush.

A New Zealand indigenous plant is *Clematis indivisa*. In spring it produces large pure-white flowers in profusion which are very attractive against the dark evergreen leaves. It is a very showy plant in the New Zealand bush and should provide a very satisfying canopy.

### Deciduous Plants

Though there are many other suitable evergreen plants, there are more deciduous plants of greater beauty. Deciduous clematis holds a high place among choice subjects for clothing pergolas. There are a number of types which flower from October to May. As clematis flowers in full sun, but prefers its roots to be in the shade, the best aspect of a pergola would be one running north and south, thus giving plants with flowers on the pillars a place in the sun for at least half a day. *Clematis montana* varieties are popular plants flowering on pergolas in October and November.

Varieties of *Clematis jackmani* are excellent for training on pillars. Each year they climb to a height of 5ft. to 8ft. and flower during summer and

autumn. After flowering, the growth is cut down to 10in. from the ground. If they are left unpruned, they grow to a greater length, but the bases become bare.

Among the most handsome of spring flowering climbers is *Wistaria sinensis* with its large mauve flowers which hang in attractive racemes often 2ft. to 3ft. long. Because of the drooping nature of the flowers high pillars are more necessary to keep the flowers above traffic along the path. There are several varieties of this October-December flowering subject. If laburnum can be trained between the wistaria, the contrast of yellow and mauve is most effective.

Perhaps a less known but very effective climber is *Campsis chinensis*, formerly known as *Tecoma grandiflora*. This is a climbing shrub with flowers at the end of the young growth. The flower is of a funnel form, scarlet in colour and about 2in. across, appearing in January. It grows well on well-drained sandy soil in a sunny aspect, often making 15ft. to 20ft. of growth in a season. The hardier variety *Campsis radicans* has a climbing rather than shrubby habit of growth, the stems having more aerial roots to assist it to cling to the pergola. The flowers are larger, longer, and of orange and scarlet hues.

One of the best plants is *Vitis coignetiae*, the "crimson glory vine", truly named for its glorious wealth of rich autumn leaves shaded gold, yellow, and scarlet. The flowers and fruit are insignificant. The stems with their tendrils hold the plant to the structure. Tying of young growth directs it into position. A plant in rich well-drained warm soil dressed with a little lime will make 12ft. to 20ft. of growth in a season.

*Parthenocissus* is a high-climbing vine which assumes beautiful tints in autumn and has bunches of small greenish flowers followed by bluish black or black berries. This vine is valuable, as it clings firmly to its supports. *Parthenocissus quinquefolia*, often listed as *Vitis quinquefolia* or *Ampelopsis quinquefolia* and commonly known as the virginian creeper, bears large brilliantly coloured autumn leaves.

Another popular vine is the small-leaved virginian creeper known now as *Parthenocissus viticuspadata* (often called *Ampelopsis viticuli*). This lofty climber with its smaller leaves appears to attach itself more closely to its supports. There are several varieties.

*Jasminum nudiflorum* is a hardy winter flowering shrub which can be trained against a trellis.

For districts where the weather is warmer and more congenial such ornamental plants as *aristolochia*, *Asparagus plumosus*, *bougainvillea* varieties, *Cobaea scandens*, *Hoya carnosa*, *Lapageria rosea*, *Solanum jasminoides*, and *Trachelospermum jasminoides*, etc., may be used.

Among tender ornamental climbers passion flowers have a place. They have flowers of odd structure and some produce edible fruit. Among the several species *Passiflora edulis* is the common black passion fruit, with white flowers tinted purple, which is grown extensively in Australia and in the warmer districts of the North Island.

The rose must find a place on the pergola. A sunny site not unduly exposed to strong winds with a rich well-drained soil will be found suitable for their culture. Roses are better grown on the pillars, as pruning requires continual replacement of old flowering stems. Some gardeners



attempt to grow roses over the rafters, with the result that a mass of flowers appear above and very few flowers around the pillars. It is better to grow more vigorous climbers above, and have roses at lower levels where they can be trained and the spent flowers easily removed. Plants with flowers out of reach of easy cultural attention tend to be neglected. A good composition is *Clematis montana* or *Vitis coignetiae* for the canopy and various climbing roses of the hybrid tea, hybrid perpetual, or tea classes for the pillars.

Plants that may be suitable for trellis fences should have a fair height and respond to pruning or training. Some of these are climbers that are used on pergolas, such as campsis, clematis, roses, polygonum, and wistaria. Among shrubs that can be used are *Cotoneaster francheti*, *C. microphylla*, *C. horizontalis*, *Forsythia intermedia*, *Cydonia japonica*, *Fuchsia riccartoni*, *Ribes sanguineum*, *R. fuchsoides*, *R. aureum*, *Lonicera hildebrandiana*, and *Hydrangea petiolaris*. Even trees may find a place. Cordon or espalier fruit trees combine beauty with productive capacity. Where trellis fences are erected over pavement spot planting with suitable plants enhances drives or paved yards. A useful and strong growing deciduous climber for this purpose, with panicles of white flowers during summer and autumn providing an excellent cloak, is *Polygonum. baldschuanicum*.

### Commercial Use of Trellis

The distance between trellis fences to provide shelter on commercial holdings is governed by site and type of crop grown. A general principle is that the greater the height of fences the fewer required to shelter a given area. The higher the fence is the stronger is the material required to withstand the wind. Chrysanthemum growers prefer shelter 5ft. to 6ft. high with posts embedded 2½ft. to 3ft. in the ground. The fences are spaced 25yds. to 30yds. to give a fair amount of protection. Iceland poppy growers would find a series of 3ft.-high trellis fences spaced 8yds. to 10yds. apart useful. A temporary low trellis may be put up by attaching it to iron pipes driven into the ground.

Durability of trellis fences is increased by making them of alloy metal or of hardwood timber, the cross-pieces and laths being attached to reinforced concrete posts. The life of timber used can be lengthened by painting it with preservative. The best colour of paint for commercial gardens is white or aluminium. Light colours increase the light intensity about plants, and reduce the number of dark places for hibernating pests.

### Trellis for Support

Wire and pipes are the usual materials for the support of commercial crops. Though several kinds of trellis are used for the support of grape vines, bigger crops are produced on overhead wire trellis. To make this overhead wire trellis first fix the corner posts into position. They may consist of light rails, reinforced concrete posts, or stout wooden posts securely fixed to concrete blocks. All outside posts have an outward slant of



A pergola clothed in summer foliage.

[Green and Hahn



Round stone pillars add charm to a garden.

[Green and Hahn

a few feet to take the strain of the net and reduce the tension on the stays. The outside posts are 7ft. high and 10ft. to 15ft. apart, depending on the width of the vine row. The vines are planted on the square to enable cross cultivation. Inside standards are 7ft. long, tapering from 3in. at the base to 1in. at the top. A flat stone or block is placed beneath each standard to prevent it from sinking into the ground. The wire system consists of strong unstretchable wire cable, consisting of 6 strands of oval No. 12 by 14 or round No. 13 steel wire intertwined, strained and wound round the outer edge of the trellis, and clamped to the outside poles. The network consists of 2ft. or 1ft. squares made of single strands of galvanised steel wire.

The advantages of overhead trellis over low trellis appear to be in the production of a larger crop and better quality fruit through less bruising, and there is more freedom for cultivation. The disadvantages are difficulty in controlling mealy bug, the thinning of the crop is more tiring, and there is more likelihood of exposure to strong winds. The area beneath the trellis does not check the wind to such a degree.

Chrysanthemums and carnations grown in a bed system are supported frequently by overhead trellis. The tiers of trellis are governed by the height of the crop. For carnations it is usual under glass to have 3 tiers at 10in., 20in., and 30in. from the ground. The holes in the net are 6in. to 8in. square or oblong. A framework of 1in.



to 1½ in. pipe is placed at intervals along the 4ft. to 5ft. wide beds. To this is attached the galvanised No. 14 or No. 16 wire. The outer wires on each side of the beds are often thicker than the inner wires. The cross strands to make the oblong or square pattern of the nets may be of fine wire or of string. As the plants last only 3 years in the beds, string would be adequate for supporting the blooms.

Chrysanthemum growers would find pig or sheep wire netting supported on No. 8 galvanised wire and attached to posts at suitable distance apart useful to preserve blooms from damage by wind. As the plants grow the net can be raised to provide support more effectively at certain heights of the stem. In this way the net is giving a bigger service as the plant gains in height.

### Garden Work for April



As the planting season for trees, shrubs, and herbaceous plants will soon be here, it is advisable to place orders now with nurserymen for plants that are to be bought in and so avoid disappointment, as stocks of popular varieties are usually limited.

The soil should be cultivated and enriched now in readiness for these plantings, which should be carried out as early in winter as possible.

### Spring Bulbs

Gardeners who have not already planted spring bulbs should make haste while there is still warmth in the ground. Many gardeners regard the word bulb as including in its range corms and tubers. Some examples of the three classes are:—

Bulbs: Narcissus, hyacinth, and tulip.

Corms: Crocus, freesia, and ixia.

Tuberous rooted: Anemone and ranunculus.

A selection of spring flowering bulbs planted without delay will make an early display as massed plantings or in grassy banks, herbaceous borders, or rockeries.

Ranunculus and anemone are colourful when massed together. They should be planted 2 in. to 3 in. deep and 8 in. to 12 in. apart in rich open soil dressed with 2 oz. of bonedust to the square yard.

### Rock Gardens or Border Edgings

There are numerous smaller bulbs which are mainly used for edgings or in larger rock gardens. A suitable site should be chosen for them, as they can be left in the same position for a number of years and there is little need to disturb them. Some which are ideal for this purpose are chionodoxa (glory of the snow), erythronium (dog's tooth violet), fritillaria, galanthus (snowdrop), crocus, muscari (grape hyacinth), freesia, lachenalia, *Narcissus bulbicodum*, sparaxis, tritonia, babiana, and ixia.

### Bowls of Bulbs

If some plantings of bulbs were made as outlined on page 96 of the January issue of the "Journal", they

should soon be ready to bring indoors. Six to eight weeks after the bulbs have been planted and set in cinders or soil outdoors is the usual period given. Wash the pots and bowls, freshen up the surface of the soil by lightly stirring with a pointed stick or nail, and then place them in a cool position in the house, but not where the plants will become drawn. If the pots are placed in a warm room or far away from a window, the leaves of the bulbs will grow too quickly to the detriment of the flowers. Water them sparingly, and do not move the containers to a warm room until the flower buds are clearly visible.

### Dahlias

Dahlias may be treated as ordinary herbaceous perennials and may be left in the ground with perhaps a slight moulding up through the winter in districts where frosts are not severe and are few in number. Elsewhere, or if the stock is to be increased, the roots should be lifted as soon as the tops have withered down. The tops will need trimming off to within 6 in. of the tubers.

They should be labelled if they are named varieties. They should be put in an airy place to dry off, and finally stored in a cool but frost-free place.

### Begonias

Tuberous begonias that have been grown in pots may now be getting past their best and should be gradually dried off as their final blooms fade. This natural process may be assisted by watering the begonias less and less as the foliage and stems change colour and die. The pots may be finally stored on their sides in a cool, dry place, or the tubers turned out of their pots and gently removed from the surrounding soil and stored in a cool, dry place in boxes of perfectly dry sand. The tubers should be kept dry to avoid any chance of premature growth, and they must be protected from frost, which may injure or kill them.

### Annuals

In northern districts annuals such as larkspur, linaria, clarkia, nemophila, calendula, cornflower, shirley poppy, godetia, nigella, annual chrysanthemum, eschscholtzia, and viscaria sown thinly now in vacant patches in the border will winter as small plants and flower early next year.

The seed can be sown in drills in sheltered sunny positions so that losses will be reduced to a minimum. The growth of weeds in autumn is a menace to the seedlings and when the seed is sown in drills weeding can be carried out more conveniently.

When conditions are suitable in late August plants raised in this way may be transplanted to the beds or border where they are to bloom. If they are sown where they are to flower, it is essential to thin out the seedlings as growth progresses until they are 8 in. to 9 in. apart, as each mature plant will occupy at least that space. Over-crowding leads to weak growth and a short disappointing flush of flowers instead of a prolonged display.

### Herbaceous Plants

Herbaceous plants in the flower border should have withered flower heads and any yellowing top growth removed regularly to maintain tidiness which is so necessary around the late flowering kinds at this period of the year. As the sap from the top growth returns to strengthen the crown from which the following season's growth is produced, it is advisable to remove this growth gradually as yellowing occurs and to cut cleanly to avoid damage to the rootstock.

### Division of Clumps

If the plants have not been divided in recent years and are now in thick over-crowded clumps, it would be advisable to attend to the division of these at the first opportunity. When the clumps are dug up smaller vigorous pieces from the outside are removed and kept for replanting; these will give a better display than the older declining parts. Most perennial plants benefit by being lifted and divided every 3 years at least, but there are exceptions, and if hellebore, peony, tritoma, gypsophila, dictamnus, geum, heuchera, and *Romneya coulteri* are looking well and showing no signs of deterioration, it will not be necessary to take them up as regularly as advised for others.

In the southern districts of the South Island where soils are heavier and winters may be severe there are a few perennials whose fleshy roots may require earthing up or covering with bracken for protection against the elements, if they are not dug up and removed indoors, for example, *Dicentra spectabilis* (bleeding heart), *Lobelia cardinalis*, anchusa, and verbasum.

### Cuttings

Hardwood cuttings may still be prepared and planted in the open. This is an easy way of increasing such plants as rambler roses, privet, escallonia, *Lonicera nitida*, tamarisk, buddleia, olearia, ribes, senecio, most hedge trees, and shrubby veronics.

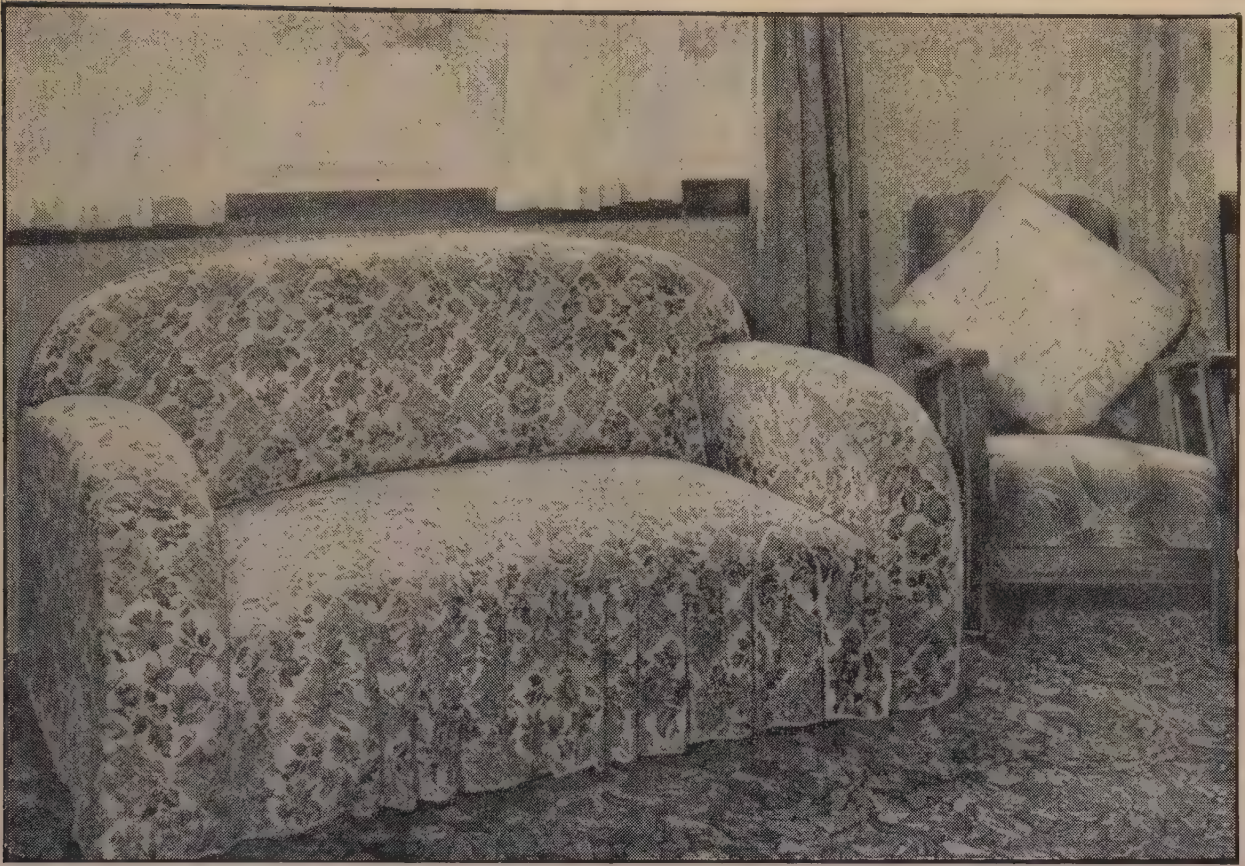
Each cutting should be made from firm well-ripened new wood, 8 in. to 10 in. long. The tip of each cutting should be trimmed just above a leaf and the base cut cleanly below a leaf. After the leaves are removed from the lower portions they should be inserted firmly into the soil at a slight angle to about half the depth of the cutting. A sprinkling of sand along the bottom of the trench where the base of the cuttings will rest, although not a necessity, would be an aid to good rooting.

### Spring Bedding Display

Plants set out now come away very well because the soil still retains some of its summer warmth as well as moisture from the autumn rains.

Many flower seedlings in addition to the necessary biennials may now be planted out to make an early show in spring. Planting of the following, if not already done, should be completed before the end of the month: Iceland poppy, lupin, aquilegia, pentstemon, gaillardia, Brompton and Beauty stocks, viola, pansy, primula, carnation, polyanthus, hollyhock, wallflower, sweet william, Canterbury bells, myosotis (forget-me-not), and *Bellis perennis* (double daisies).





## Loose Cover for a Bed Settee

By NELL MACPHERSON, Field Officer in Rural Sociology, Department of Agriculture, Auckland

**T**HE bed settee, a double-purpose piece of furniture, usually has to withstand hard wear and is consequently built to last. Most often placed in the sitting room, it should match with the decorative scheme and when it starts to show wear it can be loose covered to freshen it up and add a new note of colour interest to the room. The settee must be easy to open and the loose cover designed so that it is necessary to remove the seat cover only when one wants to use the settee as a bed. The finished cover illustrated consists of four parts: The back section, the left arm section, the right arm section, and the seat section, and these four parts are domed together to make the complete cover fit properly.

**B**ECAUSE loose covers take time and effort to make, it is wise to choose a sturdy fabric which is colourfast to sun and washing. The material should have a fairly tight weave so that it will not wrinkle or stretch, and the colour and pattern of the material should blend with the colours and patterns in the room. If a plain fabric is wanted, denim is good, as it is available in a wide range of colours, is usually pre-shrunk, and is colourfast. If a patterned material is wanted, a printed furnishing linen or furnishing cotton is probably best. Patterned fabrics do not show soiling as quickly as do plain fabrics, and where there are young children a patterned fabric is often a wise choice. A material with a large motif which must be

centred on the cover is less easy to cut and there also tends to be considerable waste when it is being matched. A smaller pattern or an all-over pattern can be matched more easily. If it is possible to obtain a material which does not have a one-way design, the loose cover can be cut more economically.

### Cutting the Pattern

Experienced workers cut the material on the settee, but the home sewer usually finds it better to cut a pattern and then place the various pattern pieces on the material to cut them to the best advantage. Use firm brown paper and pin it to the main seam lines as a guide. The following pattern pieces are needed for the bed

settee illustrated: Outside back, top back, inside back, under inside back, under curve of the inside back, inside arm, top arm, outside arm, seat, and apron (see diagrams on page 288 for locations).

**Inside back:** Mark the centre of the back. Pin the straight edge of the paper to the centre back and the top to the seam line across the top of the back. Smooth the paper to the curve of the back and the curve of the arm and fold and pin in any darts needed to give a smooth fit. Mark the outline of the pattern with a black pencil line along the back seam and the curve of the arm and along the bottom edge. Remove the paper and cut the pattern.

**This makes a pattern without seam allowances.**

Either make a note on the pattern to allow  $1\frac{1}{2}$  in. for seams and turnings or cut a new pattern with these seams allowed.

**Under inside back:** Open the bed settee and mark the centre of the back and pin the paper to the bottom edge of the inside back. Cut the pattern in the same way as for the inside back. No allowance has been made for seams. Mark the pattern suitably.

**Under curve of the inside back which fits over the arm:** Open the bed settee and pin the paper to fit this piece. Mark the seam lines for the



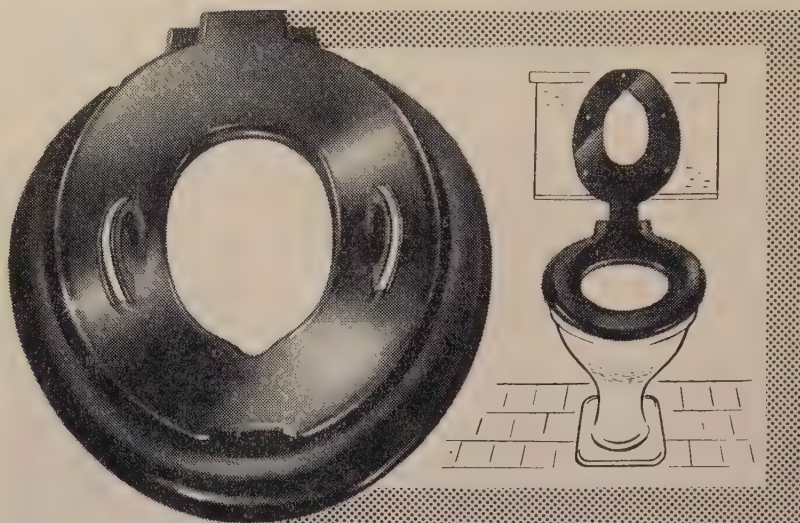


Illustration above shows the hinged supplementary seat lowered in position for children . . . note the correct size for tiny tots and the safety hand grips—if required, scarf or strap can be slipped through handles and around child for added security.

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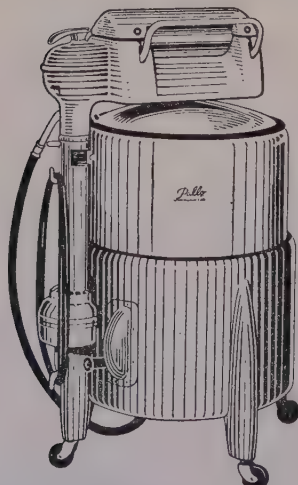
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**PALLO**

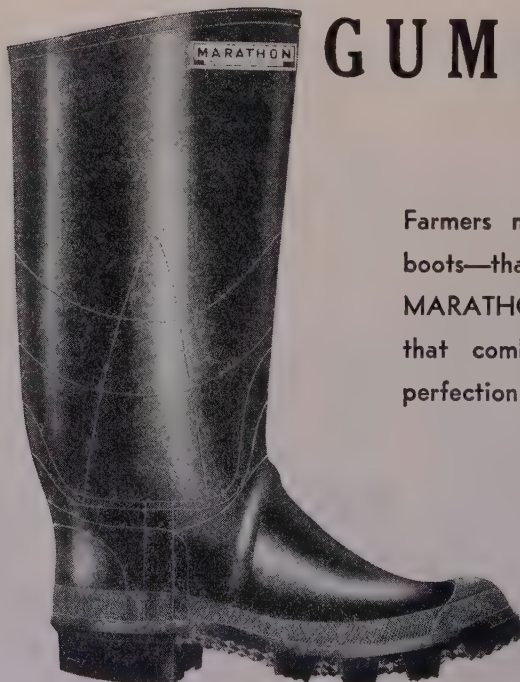
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pattern. No allowance has been made for seams; therefore when cutting this pattern allow for  $1\frac{1}{2}$  in. seams all round and mark the pattern appropriately.

**Top back:** Mark the centre and pin the paper to the centre. Follow the seam lines and cut the pattern. No allowance has been made for seams; mark the pattern appropriately and allow for them in the cutting out.

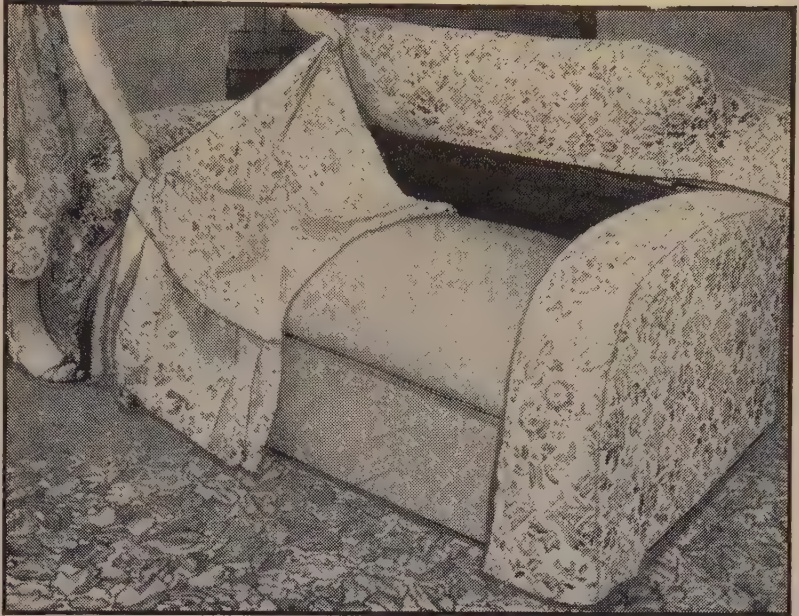
**Outside back:** Mark the centre of the back and place the paper along this. Pin it to the seam line at the top of the back and smooth it carefully out to the side. Mark along the seams and cut the pattern. No allowance has been made for seams; therefore mark the pattern appropriately and allow for them in cutting out.

**Inside arm:** Open the settee and pull out the mattress. Pin the paper to the top seam of the arm and mark it carefully along the seam line. Smooth it down to the bottom of the arm and allow 8 in. to lie on the mattress. Mark this carefully. Unpin the paper and cut the pattern. Allowance has been made for tuck-in but not for seams or turnings; allow for these when cutting out.

**Top arm:** With the settee open measure the arm from the back (X in the lower diagram on page 288) to the floor and measure the width. This is a long straight piece and a pattern of it is not needed.

**Outside arm:** Pin the paper to the top seam and allow 8 in. to go round the back for the underlap and smooth it down to the floor. Carefully mark the top and front seams. Cut the pattern. Allowance has been made for the underlap but not for seams, so allow for these when cutting out.

**Seat:** Tip up the inside back of the settee and mark the centre of the seat. Place the paper at the back edge of the seat and pin it firmly. Smooth it out to the side and mark down the



Taking off only the seat cover before using the settee as a bed.

edge. Smooth it over the front of the seat and pin it along the seam. Mark along here. Take off the paper and cut the pattern. Allow 8 in. tuck-ins on the side of the seat and allow  $1\frac{1}{2}$  in. for seams and turnings. Mark the pattern to show this and allow for them when cutting out.

**Apron:** This is a straight piece and does not require a pattern. Measure the width of the apron and the height from the floor. This piece looks better if gathered or pleated; to provide sufficient material to allow for this the

piece of material for the apron will have to be  $1\frac{1}{2}$  times as wide as the apron on the settee. No allowance has been made for seams or turnings, so allow for these when cutting out.

### Laying Pattern on Material

Once the pattern pieces have been carefully labelled and sorted the next step is to lay them out on the material.

1. When cutting the inside, under inside top, and outside backs and the seat remember that the pattern is for half the width only and either cut on the fold or cut two pieces (allowing for seams) and join them. If cutting two pieces, make sure that the pattern matches.

2. Allow for seams, etc., as required for the different pattern pieces.

3. When setting the pattern on the material remember to leave two long matching strips for the tops of the arms and also a piece or pieces of sufficient length and width for the apron.

4. Remember to cut two inside and outside arms and two pieces for the under curve of the inside back.

5. When the pattern is laid out mark round the pieces, allowing for seams, turnings, and tuck-ins where necessary, with chalk.

6. Cut out the various pieces; leave the pattern on the pieces until sewing is started.

### Making up the Cover

To make up the cover proceed as follows:—

1. Join the under inside back pieces together if necessary and also the inside back pieces. (See step 1 of laying the pattern on the material.)



The tuck-ins for the arm covers lie flat on the open mattress.



## Calculating Material Required

For the bed settee illustrated a 31in.-wide furnishing linen was used, because it cut more economically than materials of other widths, and because of the type of the pattern chosen the seams were made down the centre for the inside top and outside backs, seat, and apron.

|                                                                                                                           | No. of lengths | Material required in. |
|---------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------|
| Inside back: A = 24in. + 3in. for seams .. .. .                                                                           | 2              | 54                    |
| (Cut extra width at top from the sides of top arm pieces)                                                                 |                |                       |
| Under inside back: Q = 14in. + 3in. for seams .. .. .                                                                     | 2              | 34                    |
| Outside back: K = 32in. + 3in. for seams .. .. .                                                                          | 3              | 105                   |
| (Width 64in. + 12in. for seams = 76in.)                                                                                   |                |                       |
| Top back: I = 5½in. + 3in. for seams .. .. .                                                                              | 2              | 17                    |
| Under curve of inside back: N = 15in. + 3in. for seams .. .. .                                                            | 1              | 18                    |
| (Only 10in. wide, so both can be cut from one length)                                                                     |                |                       |
| Inside arm: L = 15in. + 8in. (tuck-in) + 3in. for seams .. .. .                                                           | 2              | 52                    |
| Outside arm: F = 23in. + 3in. for seams .. .. .                                                                           | 2              | 52                    |
| Top arm: M = 46½in. + 3in. for seams .. .. .                                                                              |                | 49½                   |
| (2 lengths, but only 10in. wide; therefore both can be cut from 49½in. of 31in. material)                                 |                |                       |
| Seat: D = 37in. + 3in. for seams .. .. .                                                                                  | 3              | 120                   |
| (Width 51in. + 2 tuck-ins of 8in. + 9in. for seams = 76in.)                                                               |                |                       |
| Apron: H = 11in. + 3in. for seams .. .. .                                                                                 | 3              | 42                    |
| (Width 51in.; therefore for gathers as in cover illustrated allow another 26in. of 11in. length + 9in. for seams = 86in.) |                |                       |
| Total .. .. .                                                                                                             |                | 543½                  |

= 45ft. 3½in. = 15yds. 3½in.\*

\* 3½in. can be saved by cutting some of the seams slightly less than ½in., therefore buy 15yds. of covering material.

### KEY TO DIAGRAMS AT RIGHT

#### Upper

|        |        |        |        |
|--------|--------|--------|--------|
| in.    | in.    | in.    | in.    |
| A = 24 | B = 64 | C = 51 | D = 37 |
| E = 10 | F = 23 | H = 11 | L = 15 |

#### Middle

|           |           |           |
|-----------|-----------|-----------|
| G = 73in. | J = 64in. | K = 32in. |
|-----------|-----------|-----------|

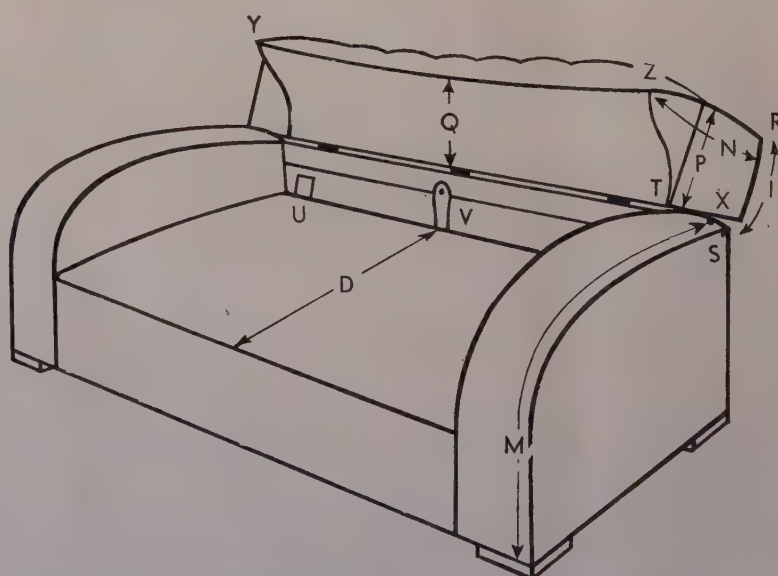
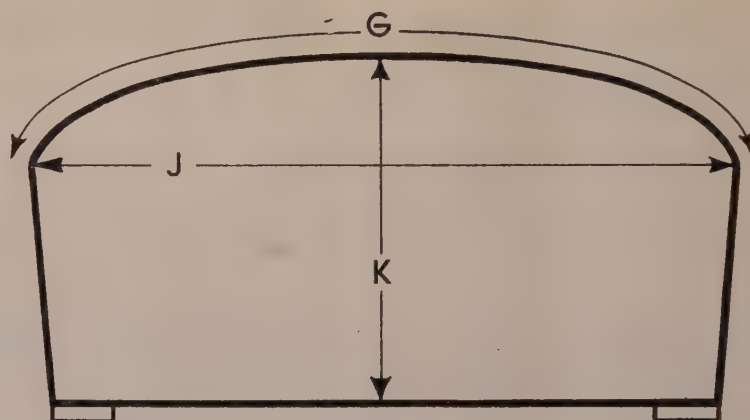
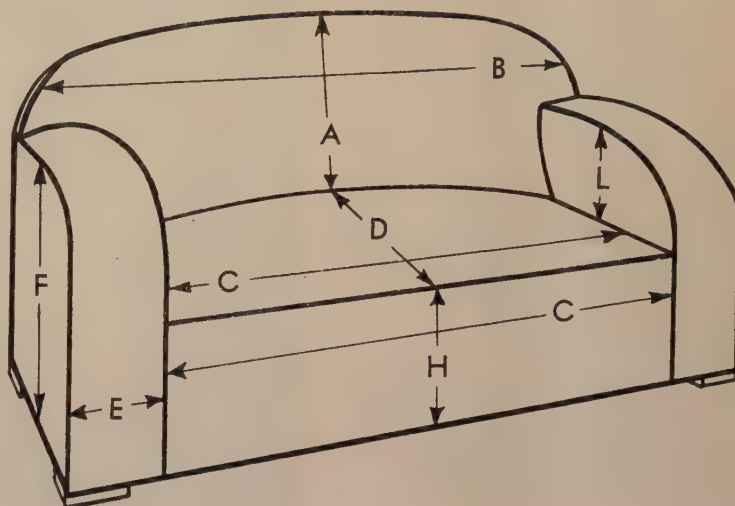
#### Lower

|        |         |        |
|--------|---------|--------|
| in.    | in.     | in.    |
| D = 37 | I = 5½  | P = 10 |
| N = 15 | M = 46½ | Q = 14 |

V is the latch which holds down the seat.

U is the leg which supports the mattress when the settee is being used as a bed. The other leg is hidden by the curve of the arm.

## Measuring Bed Settee for Amount of Material Required for a Loose Cover







The under curve of the inside arm, showing the right and wrong sides of the finished cover. Right—The various sections of the cover are domed together to give a neat fit.

Tack the under inside back to the inside back along YZ in the lower diagram on page 288.

2. Join the top back pieces together. Tack the top of the inside back to the top back.

3. Join the outside back pieces together if necessary. Tack the top back to the top of the outside back.

4. Tack each end of the top back to the upper edge (RS in the lower diagram on page 288) of the under curve of the inside back piece. Then carefully fit the curve to the side edge of the inside back along RZ in the same diagram and tack the material.

5. Tack each end of the under inside back to the end of the under curve of the inside back piece which covers the arm along ZT in the lower diagram on page 288.

6. Fit the pieces made so far on the bed settee.

7. Tack each of the outside arm pieces to each of the top arm pieces, starting from the floor edge of the pieces.

8. Working from the back edge of the top arm piece, tack it to the inside

arm piece along the top and front. Repeat for the other arm piece.

9. Gather or pleat the apron piece to fit the front of the seat piece and join these together. Work from 9½ in. in from each edge, as the tuck-ins at the sides of the seat are not joined to the apron.

10. Try the cover on the bed settee.

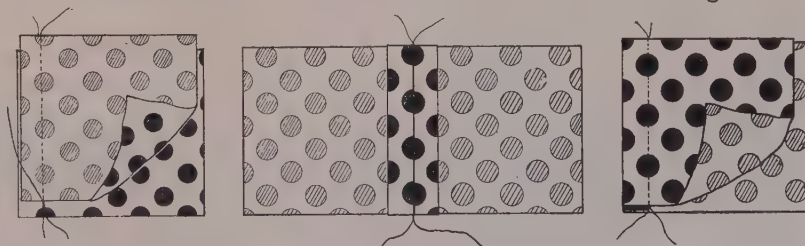
11. Alter to fit if necessary. Then sew all the seams by machine.

12. Turn under all the raw edges and hem them down either by hand or machine.

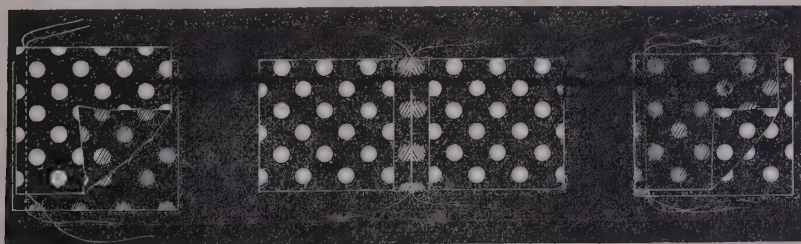
13. On the top corner of each of the underlap pieces of the outside arms sew a snap fastener and sew the matching fastener to the back of the couch.

14. Sew snap fasteners down the side edges of the outside back and in matching positions on the top back and the underlap of the outside arm to fasten the outside back firmly.

15. Sew tapes at each of the back corners of the seat covering to tie the



Upholsterer's seam. Left (step 1)—Sew 2 pieces of material together, wrong sides out. Middle (step 2)—Press the seam. Right (step 3)—Fold the two pieces as shown and stitch together. The seam stands up on the right side of the material.



French seam. Left (step 1)—Sew 2 pieces of material together, right sides out. Middle (step 2)—Press the seam. Right (step 3)—Fold the two pieces as shown and stitch together. The seam stands up on the wrong side of the material.

cover to the legs and also at the centre to tie the cover to the latch which holds down the seat.

16. Sew snap fasteners to each side edge of the apron and in matching positions on the front of the arm to hold the apron firmly in place.

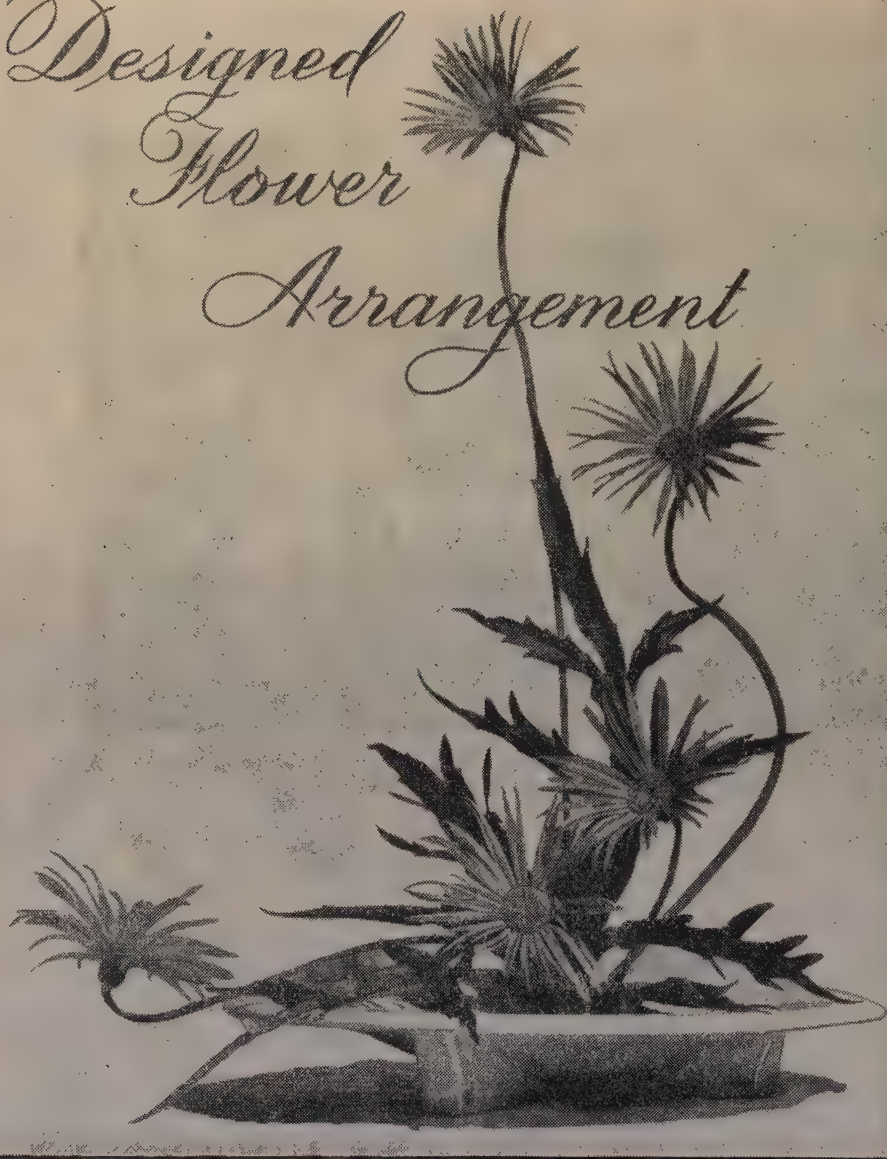
17. Press the seat and apron piece and fit the cover on to the settee. Press it on the settee.

**Type of seam:** For this loose cover an upholsterer's seam or a french seam is best (see diagrams above and at left).

All photographs by Sparrow.



# Designed Flower Arrangement



THE basic principles involved in the composition of flower arrangements are design, balance, scale, and harmony of colour and texture combined to produce a unified whole. Instructions on how to use these essential principles for successful composition are given in this article and will be continued in next month's issue of the "Journal" as part of the series of articles on flower arrangement by Margaret O'Brien, Horticultural Department, Massey Agricultural College, Palmerston North.

DESIGN can be defined as the planned relationship of flowers one to another (the word "flowers" to include all plant material used) and to the container in which they are placed. Line or lines are the basis of design and may be horizontal, vertical, radiating, or semi-circular, but all should converge on the focal point, which, as the name suggests, is the point of greatest interest in any design, the point from which the eye travels up the lines of the design and back without effort or distraction caused by the confusion of crossed main stems. Focal points are almost invariably placed low, near the rim of the container, and well forward, so that another way of expressing radiation from

the focal point is to say that strong lines do not cross above the water line. What becomes of them below the water line is of no concern in an opaque container, but those who really want something difficult to do should try arranging flowers above and below the water line in a transparent container.

## Outlining of Designs

The outlines of designs suitable for flowers are somewhat limited. If they are to be simple, natural, and restful, they must follow somewhat the lines of the trees and plants from which the material came. In these there are no stiff, conventional outlines, no squares,

and very few circles, but innumerable irregular triangles. A triangle of some sort could be drawn about the extremities of almost every plant that grows. The majority of flower arrangements are informal or semi-formal triangles with an occasional formal triangle and an occasional semi-circle. To obtain the correct proportions for these outlines the old Japanese rules are not to be surpassed for beauty and balance. The measurements of these lines may seem a little confusing to the uninitiated, but once mastered they give a definite plan to work to, which is always much more successful than just hoping for the best; the best seldom happens in such cases, and the usual result is confusion and waste of time.

Under the Japanese system flower arrangements resolve themselves into three clear-cut operations, namely, the establishment of the required outline, the placement of the focal point, and, finally, the filling-in, which must be bounded by the outline and must radiate from the focal point. In practice it is not always possible to place the focal point in position as soon as the outline is completed. In "mass" and "profuse" designs in tall containers it is often necessary to add some filling-in material before it is possible to secure the focal point, but it is quite a simple matter to make sure that this filling-in material radiates from a point which has been planned as the centre of interest.

## Japanese Line Design

Adapted classical Japanese line design is an informal or asymmetric design, for which straight lines are used to form the outline.

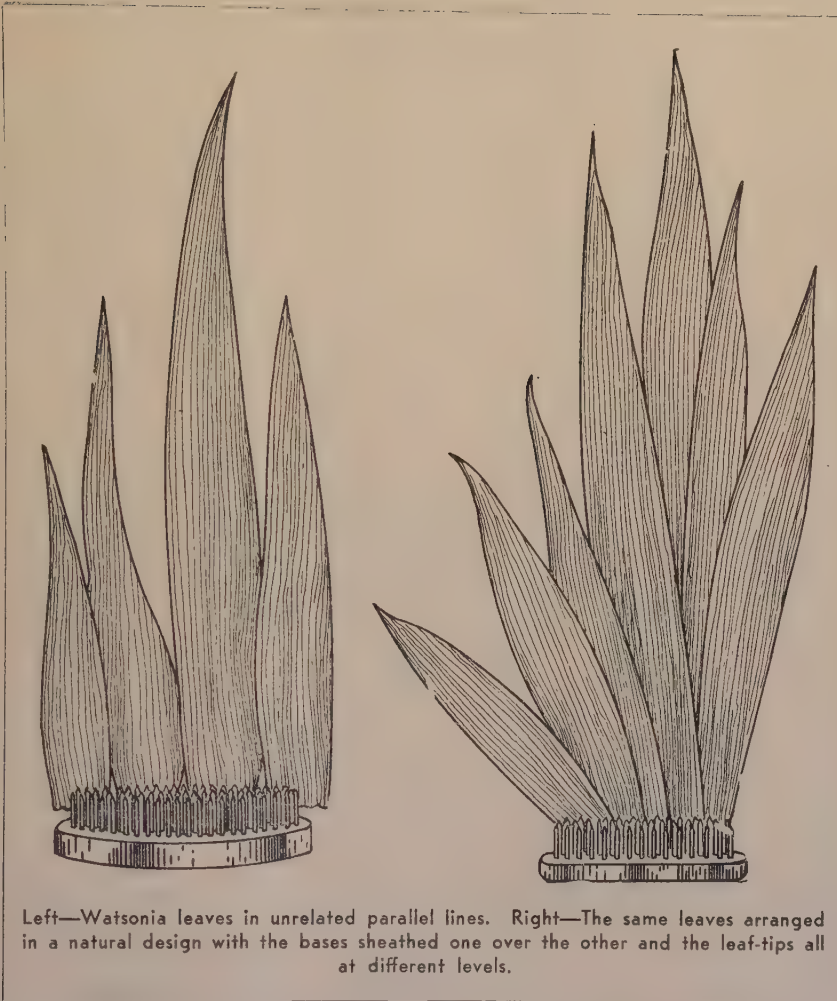
### Outline

1. The first line in every upright arrangement is the highest and is the line to which every other one is related; hence the importance of placing it accurately and firmly in position. Its height depends on the size of the container, which should be chosen for its suitability for the intended position. For low, wide trays, troughs, and plates the height of the first line should equal the length plus the width of the container. A firm, undamaged leaf or stem is selected and measured exactly, an extra  $\frac{1}{2}$  in. being allowed for fitting into the needle holder. The leaf is cut off cleanly with a sharp pair of secateurs and pushed securely on to the needle holder in a vertical position and well to the back. It is a mistake to put this first line in the centre of the holder, for there will probably not be sufficient holder space left to accommodate the remaining material.

2. The second leaf or stem should be one-half to two-thirds the length of the primary line and should be placed close to the base of the first and at a fairly steep angle as shown in the upper left illustration on page 292. With tall, slim material, such as iris leaves, it is more suitable for the second leaf to be two-thirds the length of the first, but should the leaves be heavier and broader, such as canna lily leaves, it is preferable for

HEADING PHOTOGRAPH: An informal line design using five open apricot gerberas and two cardoon leaves. Perry photo.





Left—Watsonia leaves in unrelated parallel lines. Right—The same leaves arranged in a natural design with the bases sheathed one over the other and the leaf-tips all at different levels.

the length of the second leaf to be one-half that of the first.

3. The measurement for the third line is also one-half to two-thirds that of the second, and the leaf or stem is placed on the opposite side of the primary line and at a greater angle to it than that of the second. The bases of these leaves are carefully sheathed over one another; they radiate from an imaginary focal point, or, in other words, they have been reconstructed simply on the lines of the ordinary iris plant. A triangle drawn from the tips of these three leaves now appears as a balanced outline for an informal design.

#### Outline Plus Focal Point

Next to be arranged is the focal point, which is placed low and well forward. This usually necessitates cutting off most of the stem, which is a crime to those who are first and foremost enthusiastic horticulturists, but to those who combine horticulture with flower arrangement it is the surest way to display the beauty and qualities of a well-grown flower. A dozen iris blooms, all on stems of the same length, appear more or less as a straight mass of colour supported by a regular row of stems, whereas much more form value and individual beauty can be obtained from five

blooms at varying stages of maturity on stems of varying lengths. If the focal point is put in on the same vertical line as the primary line, it will often produce a veranda-like effect, giving the whole arrangement the appearance that it may topple forward at any moment; if it is placed well forward and any remaining spaces between it and the rim of the container are filled in, both stability and depth are added to the arrangement. The outline already has height and width, and the placing of the focal point well forward gives actual depth, having much the same effect as correct perspective in a painting.

#### Filling in

The remaining material can now be placed in position. In the arrangement illustrated at upper right on page 292 this requires the addition of five more daffodil leaves, all of varying lengths, one tall bud, a half-opened flower, and a spray of ivy leaves. All these must be arranged so that they come within the bounds of the already established outline and also radiate from the focal point. They add interest and rhythm to the higher, lighter parts of the design as well as width and weight to the base. The ivy leaves fulfil a twofold mission in covering an unsightly needle holder and breaking the

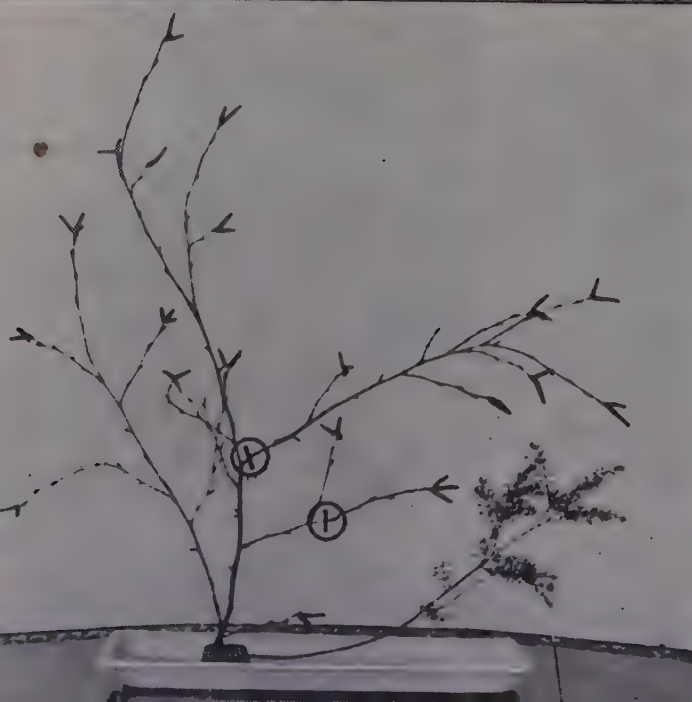


Natural balance is achieved in a line with pleasing curves by placing the tip over the base.

hard line of the rim of the container. The rhythm of an otherwise pleasing arrangement is quickly spoilt by a rim line, as the impression is given that the container is merely a receptacle which conveniently supports the



# *Varieties of Flower Arrangements*





design, not a component part of a preconceived picture made up of plant material, container, and background. Ivy or the leaves of any low-growing plant provide a natural base for tall, upright stems and leaves. The plain, dark-green aconite leaves at the base of the tall willow stems and straight snowdrops illustrated on page 85 of the January issue of the "Journal" are another example, but the leaves of daffodils or irises bent or tied in bows are by no means a pleasing substitute.

### Western Adaptations

Designed flower arrangement as adopted by Western peoples today is based on this Eastern balance and line, but has in addition a profusion of form and colour which would not appeal to an Oriental mind. Western homes, which form the third factor or background, are by no means as simple as the four walls, stool, and scroll of a typical Japanese room.

### Use of Curved Lines

With this in mind, an arranger's next step in adapting classical Japanese line arrangement is a design constructed with the same measurements, but with material which is not straight, but curved, allowing a little more latitude and the use of smooth, sweeping lines, and requiring a more developed sense of balance. Again, the primary line is of paramount importance; its balance is vital to the design. To ensure this balance the tip must be in a straight line with the base, which is a principle of balance readily illustrated in nature. A live plant blown out of alignment by wind speedily rectifies the situation as the growing tip curves back over



[Perry]

A profuse, informal arrangement outlined in white japonica and camellia buds, weighted at the bottom with violets and dark green camellia leaves, and filled in with pink and white camellias, pink and white roses, and pink carnations. The container is an off-white dish 4in. deep. The flowers are assembled on one large needle holder.

Illustrations opposite: Upper left—An informal line design for which straight material has been used, showing the first, second, and third lines of the outline and the focal point composed of one large, short-stemmed daffodil. Upper right—The completed arrangement. Middle left—An outline of an informal design in curved branches of early-flowering *Prunus* blossom. Middle right—The focal point of the completed *Prunus* design is merely short, thickly flowered twigs of the same material. A few smooth, dark green camellia leaves have been added to frame the focal point and add visual weight to the base of the design. A plain background and good light are necessary to give a clear silhouette to a design of this type. Lower left—Two branches of silver birch catkins and one of yellow boronia form the outline of this spring arrangement, but they need pruning as indicated by the black circles if they are to conform to the rules of good balance. Lower right—After the design has been pruned into shape and a bunch of blue forget-me-nots has been added as focal point, all that is required to complete the design is a little more filling in of boronia to the right of the forget-me-nots, placed well down to soften the line of the container and hide the bare stem of the third line of the outline.

Perry photos.

the root or base. It is not good horticulture to have plants leaning at odd angles in the garden, but these ready-made curves are the greatest asset in flower design, providing good natural curves, as compared to the lines of material which has obviously been forced into position.

A little extra care spent in picking branches or spikes with just the required curves for any particular design is well worth while, for though it may mean a little more time in the garden, it saves a great deal of time in the making of an arrangement. Three branches picked at random may be impossible to arrange, whereas three carefully chosen ones will fall into position easily. Floral wire as used by commercial florists has no place in flower arrangement for the home. Obviously wired stems will not last, but apart from this fact artificial curves are out of place in designs which aim at natural simplicity.

When the primary line is in position the secondary line, one-half to two-thirds the length of the primary, is added. The slimmer and lighter the material is the higher it can be. The

third line is long and sweeping with the tip curving upward. The distance from this tip to the bottom of the design corresponds with the measurements of the third line in the straight line design as shown in the two upper illustrations on page 292. The focal point is then put in position and the arrangement completed with the filling-in.

Line arrangements in general depend to a great extent on silhouette for effect. The expression of motion and life in graceful lines can be beautifully portrayed with a very little carefully selected material, in sharp contrast to a weary collection of stem ends which droop downward, indistinct clutters of foliage, or a flat wall of flowers all full-face to the viewer. If the accent is to be on form, every twig, leaf, bud, and half-open flower and open flower counts and must have adequate space in which to display its individual form, whether it be in profile, semi-profile, or full-face. As these line designs display in detail the form of the material used, they are obviously very economical and therefore useful all the





Profuse arrangements. Left—A right-angled design of scarlet Bishop of Llandaff dahlias on one small needle holder in a flat, white container. Right—Vegetables in an arrangement on a wooden plaque, designed to display the contrasting forms of round, green cherry tomatoes, curly white and purple kale leaves, large, smooth beet leaves in plum red, and green and spiky tips of wild amaranthus. Though the forms are sharply contrasted, the textures and colours blend.

year round, but particularly during winter, for those who live in small city flats and are dependent on flowers from a florist. For such people a regular supply of a few carefully chosen blooms, arranged to show their varying forms to advantage or used as a focal point for taller material gathered on a country trip, gives greater value than an occasional large and expensive bunch of flowers, which will be very liable to look out of proportion in small rooms.

### Profuse, Informal Designs

Designs with a profusion of material and informal arrangement are a far cry from those of pure Japanese line. They require a quantity of material and are suitable for surroundings demanding larger and more substantial arrangements than the Oriental designs. The outline is still an informal triangle and the balance asymmetric, but the filling-in is comparatively solid, the whole depending for its effect on outline and colour mass rather than on the individual forms of a few flowers and stems. In

any mass design the various types of flowers or leaves will have much more character if they are placed in groups and not mixed indiscriminately. These profuse, informal arrangements are suitable for a low, flat container with a "cage" holder, provided the stems are thick enough to wedge securely into the holder and the container is deep enough for the required water. A deeper, heavier container, such as a basket or an old biscuit barrel, can be successfully used, provided the holder is high enough for the stems of the third line to fit into it in an almost horizontal position.

An almost right-angled triangle is a variation of informal outline which lends itself to profuse arrangements where most of the stems are straight. For example, the comparatively straight stems of dahlias are more suited to a right-angled design than are the curved stems of white japonica, which form the outline of the arrangement shown in the illustration on page 293. In theory the second line of the triangle has been merged with the first, and this placement

has been balanced by increased depth and a mass of material placed low in the design.

### Measuring of Butter and Use of Seasoned Flour

A SIMPLE way to measure butter and a suggestion for keeping seasoned flour are as follows:—

**Measuring butter:** If a recipe calls for a portion of a cup of butter, for example,  $\frac{1}{4}$  cup, fill the measuring cup  $\frac{3}{4}$  full of water and add butter until the water reaches the top of the cup.

**Seasoned flour:** Keep seasoned flour mixed in a shaker ready for use for coating meat or poultry or for making gravy.

—ELEANOR COUSTON,  
Field Officer in Rural Sociology,  
Department of Agriculture,  
Timaru



# The Preparation and Cooking of Tripe

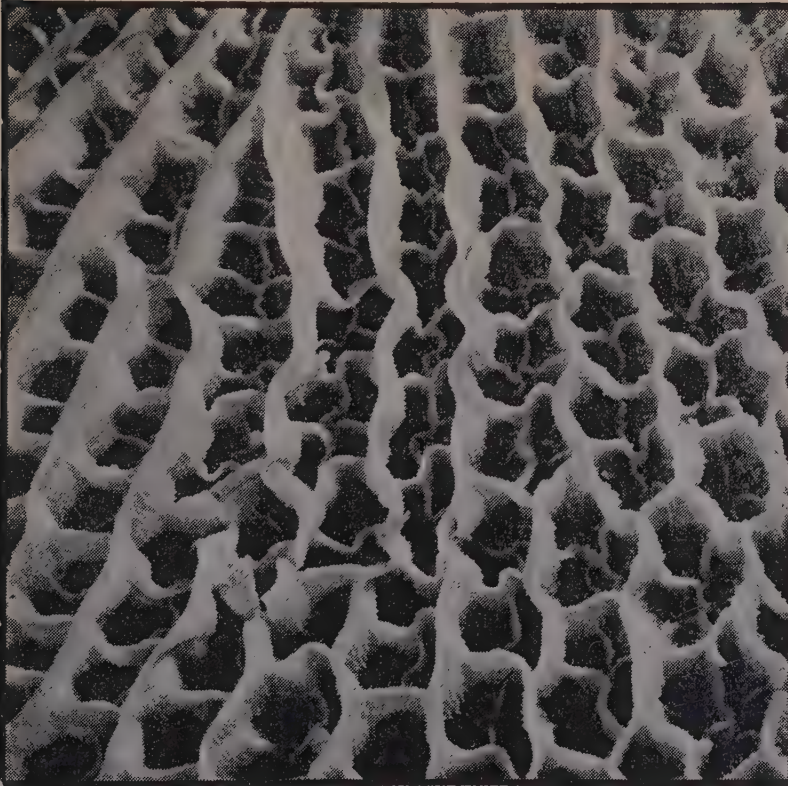
By EVELYN E. MOORE, Field Officer in Rural Sociology, Department of Agriculture, Palmerston North

ON many farms meat is killed regularly, but there are probably comparatively few of the housewives who make any use at all of the offal or organ meats. The prevalence of hydatids may be the reason for this dislike of some of the most nutritious organs in the animal, but there is doubtless much that is sound which is discarded along with that which is infected. Where the majority of sheep killed are found to be infected with hydatids, on the other hand, it would seem a sound reason for carrying out carefully the general precautions advocated by the Departments of Health and Agriculture against its spread.

WHERE there is no reason for not using them organ meats can be most useful both in providing extra nutrients (liver and kidney are valuable sources of several minerals and vitamins and, of course, protein) and in providing welcome variety in the menu.



Tripe in tomato sauce.



Honeycomb tripe is the most tender part and therefore the most suitable for frying or grilling.

Tripe is one of the organ meats which few country housewives would think of preparing for themselves. Where beef is killed for home consumption, however, the preparation of tripe which is tender and of high quality and flavour probably consumes no more time and labour than do many other tasks fitted into everyday farm life. Tripe consists of the first and second stomachs of beef. The first or large stomach can be distinguished by its "terry towel" appearance on the inside, the second and much smaller stomach by its "honeycomb" appearance. There is a much smaller quantity of honeycomb tripe in an animal, but because of its superior flavour and greater palatability and tenderness it is worth preserving even though it is more difficult to clean.

## Preliminary Preparation

The food contents of the paunch are removed by slitting the side, inserting a hose in the hole, and washing it out thoroughly with cold water. The paunch is then turned inside out and given a further thorough washing with cold water. If it is not to be scalded immediately, it should then be turned back to the original position, as this prevents the stain from penetrating the paunch.

Scalding is the next step, and if it is to be successful, care should be taken to have the temperature correct. The tripe is scalded for 10 minutes in a copper of water (14 gallons) at a temperature of 148 degrees to 150 degrees F. (65 degrees C.) and containing 1 teaspoonful of washing soda. Longer scalding will cause the tripe to toughen. After it has been scalded it is cooled quickly in a tub of running water, placed on a board or bench, and



the inner lining is beaten off with a smoothly rounded stick such as a broom handle.

At this stage the tripe is darker than that normally purchased from a butcher, but it may, if desired, be bleached to a more attractive whiteness with hydrogen peroxide. One pint of 6 per cent. hydrogen peroxide or 2 pints of ordinary household hydrogen peroxide (3 per cent.) are mixed thoroughly with 15 gallons of cold water, and the tripe is placed in this solution and left to bleach overnight.

### Preliminary Cooking

The tripe is placed in a copper of boiling water and boiled for 2 hours. It is most important to have the water boiling before adding the tripe and also to have plenty of water and a good fire so that the water will not go completely off the boil when the tripe is added; otherwise the tripe will be tough.

Tripe prepared in this way should be sufficiently tender to be cut easily with a knife or pulled apart without too much difficulty. It is now ready for stewing.

Tripe is sold commercially after this preliminary preparation has been done and requires further stewing. If, however, it feels very tough and rubbery at this stage, it has probably been incorrectly prepared, and no amount of extra cooking will make it tender. Honeycomb tripe may frequently be

purchased separately, and as it is more palatable and tender, is preferable if it is available.

### Final Preparation

To prepare tripe for eating a further 3 hours' gentle simmering or 30 minutes' cooking in a pressure saucepan at 15lb. pressure is required. The tripe remains a good colour and the flavour is not impaired if it is cooked in this way. The savoury ingredients and vegetables may be added toward the end of the cooking period, or they may be cooked separately and mixed with the tripe just before it is served. When a pressure cooker is used the latter method probably saves time.

### Recipes

#### Tripe and Onions

|                         |                            |
|-------------------------|----------------------------|
| 1½lb. of tripe          | 2 tablespoons of flour     |
| 1lb. of onions          | 1 teaspoon of salt         |
| 1 cup of milk           | ½ teaspoon of pepper       |
| 2 tablespoons of butter | Chopped parsley as desired |

Cut the tripe in pieces about 1in. square ready for serving, cover with boiling water, and add the salt and pepper. Simmer gently for 3 hours, or cook in the pressure cooker with 1 cup of water for 30 minutes at 15lb. pressure.

Slice the onions and cook them in the hot butter until they are tender. Add the flour and stir until the flour and butter are blended together. Add the milk gradually, stirring constantly, and cook until thick. Add the tripe, season with salt and pepper, and add the chopped parsley. If desired, ½ cup of chopped cooked celery may also be added.

#### Tripe in Tomato Sauce

|                                         |                         |
|-----------------------------------------|-------------------------|
| 1½lb. of tripe                          | 3 tablespoons of butter |
| 1 cup of sliced onion                   | 3 tablespoons of flour  |
| 1½ teaspoons of salt                    | 1lb. of tomatoes        |
| ½ teaspoon of curry powder              | 1 teaspoon of sugar     |
| ½ teaspoon of vegetable or meat extract | ½ teaspoon of pepper    |

Wash the tripe, cut it in serving size pieces, and cook it until it is tender. Fry the onion in the butter until it is tender, add the salt, pepper, curry powder, sugar, and flour, and mix until the flour and other ingredients are well blended with the fat. Peel and cook the tomatoes in ½ cup of water and dissolve the meat or vegetable extract in the hot juice. Stir this gradually into the onion mixture and cook until thick and smooth, stirring continually. Add the tripe, heat for a few moments, and serve. 4 to 6 servings.

#### Tripe in Mushroom Sauce

In the mushroom season ½lb. of cooked mushrooms, 1 cup of cooking liquid, and the juice of half a lemon may be substituted for the tomatoes in the previous recipe, the sugar and curry powder being omitted.

#### Tripe and Vegetables

|                         |                         |
|-------------------------|-------------------------|
| 1½lb. of tripe          | A few sprigs of parsley |
| 1½lb. of onions         | 1 sprig of thyme        |
| 2 large sliced carrots  | ½ pint of milk          |
| 1 cup of chopped celery | 3 tablespoons of flour  |
| 1½ teaspoons of salt    | 3 tablespoons of butter |
| ½ teaspoon of pepper    |                         |

Cook the tripe, vegetables, salt, pepper, parsley, and thyme together in a pressure cooker with 1 cup of water for 30 minutes at 15lb. pressure. Alternatively, simmer the tripe for 2½ hours, add the other ingredients, and cook until they are tender. Make a white sauce with the flour, butter, and milk, add the strained cooked tripe and vegetables, thin if desired with the liquid the tripe has been cooked in, season with salt and pepper as required, and serve hot.

#### Tripe in Batter

|                         |                                          |
|-------------------------|------------------------------------------|
| 1 cup of flour          | ½ cup of cold water                      |
| ½ teaspoon of salt      | 1 egg, well beaten                       |
| ½ tablespoon of vinegar | 1 teaspoon of melted butter or olive oil |
| 1½lb. of tripe          |                                          |

Prepare the tripe, cut in pieces about 2½in. square, and cook until tender. Mix the flour and salt and add the beaten egg and cold water gradually. When the mixture is smooth add the vinegar and oil or butter. Dip the pieces of tripe in the batter and fry quickly in hot fat. Serve with lemon or tomato sauce.

#### Fried Tripe

Even tripe which has been stewed until it is very tender is rapidly toughened by being heated at high temperatures, as in grilling or frying, and it should therefore be well coated in batter or egg and breadcrumbs before being cooked in this way.

Stew the tripe until it is tender, wipe as dry as possible, and cut in serving size pieces. Coat the pieces with fine dry breadcrumbs or cracker crumbs, dip them in an egg mixture, and then coat them in breadcrumbs again. A suitable egg mixture is 1 egg, 2 tablespoons of water, and ½ teaspoon of salt lightly beaten together.

Fry in a small quantity of hot fat until golden brown on each side. Place on a hot dish, dot with butter, sprinkle with chopped parsley, salt, and pepper, and serve with fried onions or tomato sauce.

## Roast Surprise



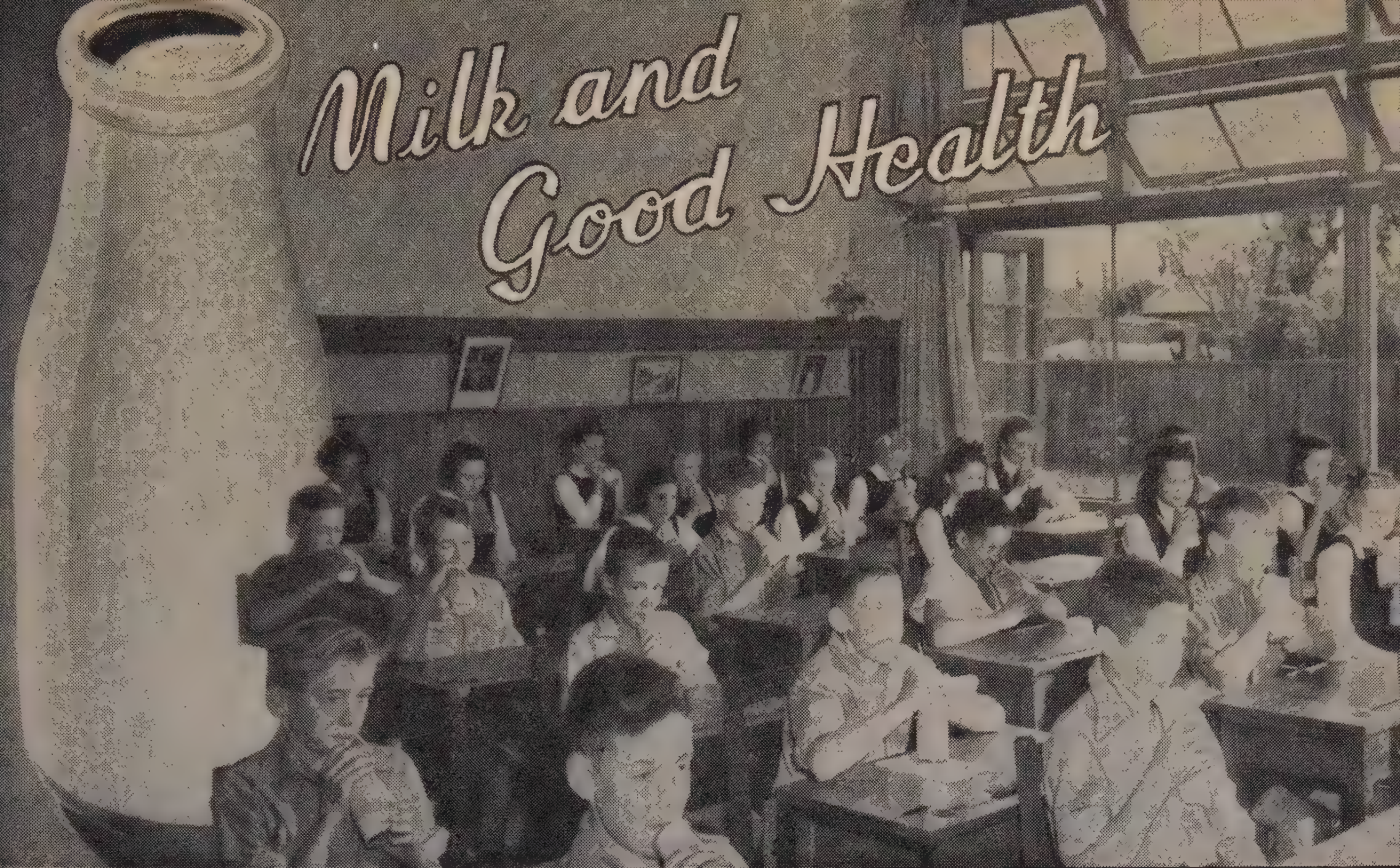
**F**OR the roast surprise dish illustrated the following ingredients are required:—

|                                         |                       |                                |
|-----------------------------------------|-----------------------|--------------------------------|
| 1lb. of potatoes (weight after peeling) | ½ pint of thick gravy | 1 teacup of fresh bread-crumbs |
| ½lb. of minced cooked meat              | 1 egg                 | Dry breadcrumbs                |
| ½oz. of dripping                        | 1 onion, minced       |                                |

Cook the potatoes, mash them well, and mix in the egg. Mix together the meat, onion, dripping, fresh breadcrumbs, and gravy. Grease a loaf tin, and coat it with dry breadcrumbs. Line the tin with a thick layer of potatoes, keeping about a quarter of the mixture. Fill the tin with the meat mixture and cover with potatoes. Bake at 300 to 375 degrees for 35 to 40 minutes. Turn out and slice to serve.



# Milk and Good Health



IT has been said that "Of all the factors of man's environment, none is more important to his welfare than food. Of all foods none is more important than milk. The people who have become large, strong, vigorous people, who have reduced their infant mortality, who have the best trades in the world, who have an appreciation of art, literature and music, who are progressive in science and every activity of the human intellect, are the people who have used liberal amounts of milk and its products". This article by Maud B. Strain, Field Officer in Rural Sociology, Department of Agriculture, Dunedin, attempts to explain why milk is so essential to good health.

**T**HE word "health" comes from the same source as the word "whole". The person who has health is a whole person; he is whole because he is free from disease, and he responds as a whole to situations. He is able to adjust himself to rapidly changing conditions because his mind is alert and his body at the top of its form and between them there is complete harmony. He has confidence in himself and is prepared to meet anything life has to offer. An old Arabian proverb expresses the same idea somewhat differently by saying, "He who has health has hope, and he who has hope has everything". In this instance "health" means perfect health, but between this and health that is merely adequate there is a big gap.

## Research Work on Nutrition

Nutrition workers working independently in different countries have all found that increasing the amount of milk consumed each day up to about 2 pints for each child has improved the physique and mental tone of those in good health, and has considerably benefited the stature and mental abilities of those not up to standard. In New Zealand where  $\frac{1}{2}$  pint of milk is supplied daily to each schoolchild, teachers report that children are showing activity and alertness

beyond that formerly met in schools. In 1926 in England Dr. H. Corry Mann increased the milk in the diet of boys in an industrial school. Before the extra milk was added these boys were being fed according to the nutritional standard for boys of their age and standard of development. During the 4 years of the experiment those receiving the extra milk grew at an average each year of 2.6in. and those without the extra milk averaged only 1.8in. increase. Moreover, those receiving the milk were more alert and showed gains in mental as well as physical development.

In Japan milk was added to the diet of a group of schoolchildren, and in 6 months the gain in weight was 88 per cent. more and the gain in height 16 per cent. more than in the control group. The children who received the milk had improved complexions and glossy skins and they became more cheerful, attended school more regularly, and were more successful in athletic contests than the control children.

An experiment carried out on Maori schoolchildren in the East Cape district showed that in 3 months during which children of one school were given extra milk and those in a neighbouring school received no extra milk

those having the extra milk had an average increase in weight of 3 $\frac{1}{2}$ lb. against the 1 $\frac{1}{2}$ lb. increase of the children in the other school, and the increase in height was  $\frac{3}{4}$ in. against  $\frac{1}{4}$ in.

The results of this type of research in all parts of the world tell the same story: Improved appearance and improvement in physical and mental performance have invariably followed the addition of milk to the diet. Before this addition many of these diets were considered adequate for health and were being enjoyed by apparently healthy individuals. As far back as 1877 Benjamin Disraeli said, "The health of the people is really the foundation upon which all their happiness and all their powers as a state depend". Since then the part played by good nutrition in human progress has become of primary importance to governments throughout the world.

In New Zealand schools an attempt is made to ensure that every child shall receive at least some part of the necessary daily amount of milk—1 $\frac{3}{4}$  pints— $\frac{1}{2}$  pint being issued to each child every school day.

## Food Value

Milk is the most nearly perfect food known, containing almost every dietary essential—protein, carbohydrate, fat, minerals, water, and vitamins, and is unique in that it is the only thing specially prepared by nature as a food. It is an excellent source of protein, fat,

**HEADING PHOTOGRAPH:** The morning bottle of milk seems to be liked by most schoolchildren. Photo at right by National Publicity.



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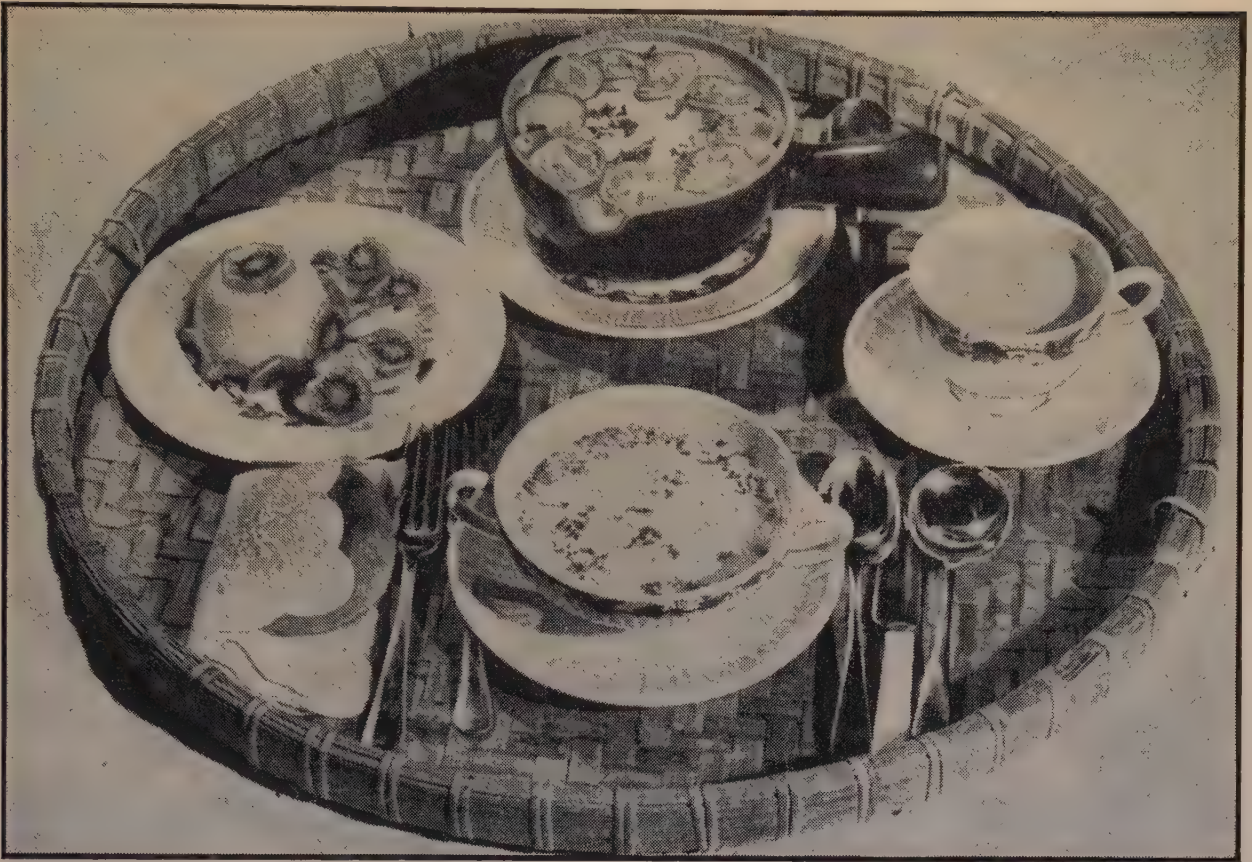
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A meal with a milk basis. Dishes illustrated are: Bottom—Cream of onion and potato soup with parsley garnish. Top—Macaroni cheese with tomato garnish. Left—Milk jelly with sliced fresh fruit. Right—Milk coffee.

and carbohydrate, all in a form easily made use of by the body, it is rich in calcium (lime) and phosphorus and supplies vitamins A, B<sub>1</sub>, B<sub>2</sub>, and D, and is an easily digested food used universally. It is important for body building and body repair and for energy. Calcium and phosphorus are indispensable for the proper growth of bones and teeth; careful scientific experiment has shown that the lime of milk is much better absorbed in the body than the lime of green vegetables or any other foods. The only two diet essentials not provided in sufficient quantities by milk are iron and vitamin C. Milk fresh from the cow contains vitamin C, but most of this is lost when milk is left standing for some time. This is why artificially fed babies must have orange juice, rose hip syrup, or another source which will supply vitamin C. A baby comes into the world with a supply of iron stored in its liver, and by the time this is used up the child is old enough to obtain its iron supply from other sources such as egg yolk.

#### Constituents of Milk

The constituents of milk are:—

Protein for tissue building and repair.

Carbohydrates for a quick supply of heat and energy.

Fats for heat and energy.

Minerals for bones and teeth.

Vitamins for body regulators.

Water for numerous purposes.

#### Protein

Milk is rich in protein, being one of the most economical sources of this important nutrient. Under normal conditions milk protein is the most completely digested and absorbed of all food proteins. Other foods rich in proteins are eggs, meat, fish, and cheese. Proteins are necessary for growth and maintenance, and without them neither plants nor animals can live. From protein comes nitrogen, which is an essential constituent of plant and animal cells. Plants are able to manufacture their own proteins from nitrogen and other products taken from the soil and air (this form of nitrogen is known as inorganic nitrogen), whereas animals are able to make use of nitrogen only in the form of organic nitrogen, that is, from foods containing proteins.

In the body proteins are broken down by digestive processes into simpler substances called amino acids; these are absorbed into the blood and carried to all parts of the body. The cells in the various tissues of the body take from the blood the amino acids which they require. The blood may be likened to a mobile draper's shop which tours a district; the various body tissues—bone, muscle, nerve, and the

rest—are the customers and the many different amino acids are the stock. Following the usual practice, these customers take from the shop just those goods which they themselves need. For example, the muscle cells take the particular amino acids which they need but which may be entirely different from those needed by the red cells of the blood or those needed by the skin and hair. To keep all parts of the body in good condition it is necessary to keep them supplied with all the amino acids required for building their own kinds of protein.

#### Carbohydrate

The carbohydrate constituent of milk is lactose or milk sugar. This is very different from cane sugar, being much less sweet, and one does not tire of it so readily; also it is barely capable of being fermented by yeast. It is, however, readily split up by lactic acid bacteria which cause the souring of milk. Lactose in the intestine helps the absorption of calcium, and this explains why milk calcium is more completely absorbed than calcium from any other source.

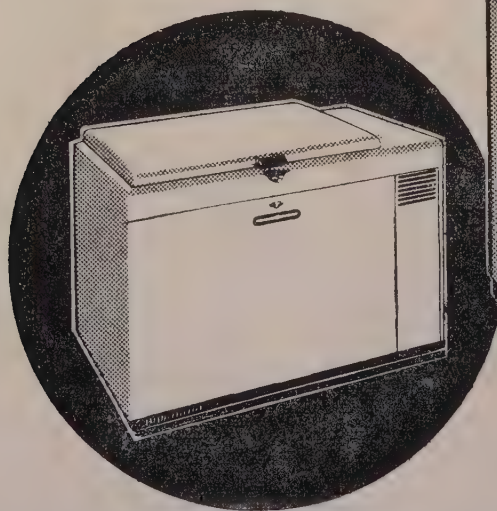
#### Fat

The fat of milk is in the form of an extraordinarily fine emulsion, so fine that one drop of milk holds at least 100 million fat globules. When milk is allowed to stand undisturbed these tiny globules rise to the top and form cream, which when churned becomes



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butter. Butter is a pleasing article of diet; fresh-cooked vegetables are doubly delicious when served with butter. Soups made with milk and butter are more satisfying than those without these ingredients because fats digest more slowly than either carbohydrates or proteins and consequently stay longer in the stomach, thus allaying hunger for a longer time. When cream is removed from milk skimmed milk remains; skimmed milk is not to be despised, because investigation has shown it to be almost as valuable in the human diet as whole milk. Vitamins A and D have been removed with the butterfat, but all the other constituents remain.

### Minerals

The minerals in milk are calcium (lime), phosphorus, iron, potassium, sodium, chlorine, iodine, and copper, most of them in extremely small amounts but each having its allotted task. Calcium and phosphorus are needed for the formation of strong teeth and bones, a trace of copper is necessary to enable the iron to be used properly, and chlorine is necessary to aid digestion. The part played by minerals in the body indicates their importance. They aid in the normal working of heart muscle, aid digestion, help to make the blood, and are an important constituent of bones and teeth. They also make possible the quick response to stimuli (sometimes referred to as "reaction time"). This is perhaps best explained by one or two examples: A person inadvertently

puts a finger on a hot iron and very quickly draws the finger away; the sensation caused by the finger touching the hot iron is the stimulus, and drawing the finger away is the response. A motorist rounding a corner sees an obstacle in the middle of the road. The time it takes him to apply the brake or turn the steering wheel is his reaction time, that is, the time that elapses between receiving the stimulus (seeing the obstacle) and doing something about it.

### Vitamins

Vitamins are substances necessary to health which the body cannot make itself but which have to be supplied ready made in food. Milk contains vitamins A, B<sub>1</sub>, B<sub>2</sub>, and D, but is lacking in vitamin C, which is present in freshly drawn milk, but disappears later.

**Vitamin A** is essential for growth, for protection against night blindness, and for keeping the lining membranes healthy.

**Vitamin B<sub>1</sub>** is essential for growth, healthy appetite, and healthy nerves. It aids digestion and helps the body to utilise carbohydrate.

**Vitamin B<sub>2</sub>** is essential for growth and health. It helps the body to resist infection and prolongs the span of active life.

**Vitamin D** aids in the use of calcium and phosphorus for bone and teeth building, favours development of a good body frame, and prevents bow legs and curved spine.

## ... MILK AND HEALTH—301

### Use in Diet for the Sick

Milk has a unique place in the diet of sick people, as no other single food is of so much value. Its fluid form makes it easily swallowed—a great gain to exhausted patients—and the quantity given can be easily regulated and measured. The amount of water it contains makes it a means of quenching thirst as well as of supplying food and makes it acceptable to feverish patients. Also, in cases of severe illness the digestion cannot tolerate concentrated foods; thus the large percentage of water in milk is a decided advantage. Its digestion requires little effort and it is readily absorbed into the blood.

### Clotting

Milk is a fluid outside the body only; as soon as it enters the stomach it is acted on by a substance called rennin, always present in the stomach, and converted into a smooth, gel-like curd. This is clotting, the same process which occurs when junket is made; rennin, which is in the commercial preparation known as rennet, is added to the milk, causing it to clot and form curd and whey. Further treatment of the curd produces cheese. Clotting is caused by the action of rennin on the protein of the milk.

### Curdling

The souring of milk is somewhat different from clotting, being due to



Left—Milk that has been pasteurised at home can be cooled quickly by placing the container in a saucepan or basin full of cold water and allowing the cold water to run for a while. Right—A good method of keeping milk cool and protecting it from contamination is to place the container in a basin of cold water and cover it with muslin or similar cloth which is long enough to hang in the water.



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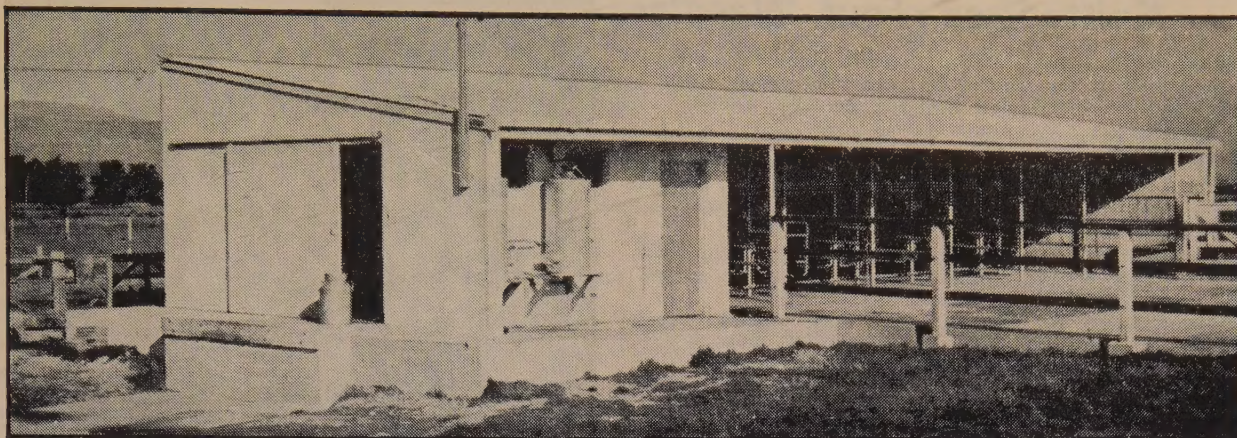
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A milking shed of this type helps greatly toward ensuring clean, wholesome milk of low bacterial count.

lactic acid bacteria in the milk. These bacteria act on the milk sugar, turning it into lactic acid, which causes the sour taste. Sour milk need not be wasted; it may be used in the making of scones and cakes and cottage cheese, which is easily made, nutritious, and suitable for use in many ways.

### Contamination

Milk as it comes from an uninfected and perfectly clean cow may be regarded as a sterile fluid, but this ideal condition is somewhat difficult to maintain. Milk may become contaminated through the use of utensils, pails, cans, strainers, and other equipment that has not been properly sterilised, from dust off the cow, through contamination from the hands or clothing of the milker or stripper, or through the milk being left to stand uncovered. Milk of low bacterial count, that is, with little contamination, can be produced from a perfectly healthy herd by maintenance of a high standard of cleanliness in the milking shed and its surroundings, by removal of obvious dirt from the cows, by efficient washing and drying of the udder and teats before milking, by careful straining, and by never allowing the milk to stand uncovered.

The two types of bacteria found in milk are lactic acid bacteria, which are relatively harmless and cause the souring which gives warning that the milk has deteriorated, and the pathogenic or disease-producing bacteria. These latter may come from the cow herself or from contamination during milking, transport, or storage.

Diseases which may come from the cow, more particularly diseases in the udder, are bovine tuberculosis (which attacks human beings, particularly children, causing tuberculous glands in the neck and abdomen and tubercular joints and bones), undulant fever, and salmonella infections; Q fever is more rare. Among bacteria which gain access to milk through careless handling are those which cause dysentery, diphtheria, scarlet fever, and typhoid. Some years ago, before the days of bottled milk, an epidemic in a North Island district was traced to a milk delivery man who, apparently quite healthy himself, was a "carrier" of the disease.

### Milk Treatment

It has been pointed out that for many reasons milk is an excellent food both in sickness and in health, but it must be safe milk.

There are various large-scale methods of treating milk to make it safe, the most widely used of which

value of the milk, is the method in general use. Milk is heated to 162 degrees F., kept at this temperature for not less than 15 seconds, then cooled very rapidly, in a matter of seconds, to 40 degrees F. Alternatively, it may be heated to 145 degrees F. and kept at that temperature for 30 minutes. It is bottled in sterilised bottles and capped, and is then ready for distribution. Until distributed it is held at 40 degrees F.

In experiments with schoolchildren and in tests on animals it has been found that pasteurised milk is equal to raw milk in nutritive value and, although there are those who oppose pasteurisation, the process when properly carried out offers almost complete insurance against the transmission of disease by milk. Robert Hutchison in his book "Food and Dietetics" says, "One looks forward to the day when the drinking of raw milk will be considered as barbarous a custom as the eating of raw meat is today".

**Pasteurisation kills all bacteria harmful to man, and though it does not necessarily destroy the lactic acid bacteria, their activity is much retarded. Therefore, once milk has been pasteurised it must be stored carefully to prevent recontamination from imperfectly washed containers or from careless handling, because with the lactic acid bacteria (which usually give warning by the sour taste that milk is not fresh) less active the milk may go bad before it goes sour.**

### Chilling

Some people are opposed to pasteurisation, preferring raw milk; for this and other reasons chilled milk is available in some districts. Chilling retards the growth of bacteria and helps to expel food flavours from the milk. It does not, however, make infected milk safe. Chilled milk should be kept at 40 degrees F. or lower, but if the temperature rises, the bacteria become active again and the effect of the chilling is quickly lost.

An article in a future issue of the "Journal" will describe ways of incorporating sufficient milk in the diet.

### Bulletins

#### for the Housekeeper

##### Nos. Free Bulletins

- 335 Cooking with Compressed Yeast.
- 350 Tomato Cookery.

##### Nos. Chargeable Bulletins

- 337 The Child and His Family. 6d.
- 338 Food and Health. 1s. 6d.

The above bulletins are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

are sterilisation and pasteurisation. (Full details for the care of milk in the home were given on page 91 of the "Journal" for January 1951).

### Sterilisation

Sterilisation is the only method by which all bacteria are destroyed. It is used largely in European countries, but is not favoured commercially in New Zealand because it has some very obvious disadvantages, one being the alteration in the taste of milk. Condensed milk, dried milk, and other processed milk preparations are sterilised during the processing.

### Pasteurisation

Pasteurisation, which destroys the disease-producing bacteria without altering the flavour or the nutritive



# A Young Girl's Sweater Knitted on Four Needles

THE sweater illustrated is a cosy, attractive garment for a young girl at almost any time of the year. The pattern below is for knitting it in natural-colour wool and four other colours.

**MATERIALS** required are: 5oz. of 3-ply wool in natural colour (N.); 1oz. each of 3-ply wool in red (R.), yellow (Y.), blue (B.), and green (G.); 4 No. 10 knitting needles with points at both ends; 4 No. 12 knitting needles with points at both ends; a medium-sized crochet hook; and 6 small buttons.

**Measurements:** Chest 28in.; length 15½in.; sleeve seam 12½in.

**Tension:** 7½ st. to lin.

**Abbreviations:** K., knit; p., purl; tog., together; dec., decrease; st., stitch(es); st.st., stocking stitch; beg., beginning; cont., continue; ch., chain; d.c., double crochet; foll., following; rem., remaining; fin., finish.

## The Body

Using 4 No. 12 needles and N. wool, cast on 208 st. (70, 69, 69 on three needles), and work in k. 1, p. 1 rib for 2in. Change to No. 10 needles and k. 2 rounds, then join on coloured wool and begin Fair Isle pattern.

1st round: \*2 Y., 2 G.; rep. from \* to end. 2nd round: In G. 3rd round: \*1 R., 2 B., 2 R., 2 B., 1 R., 2 B., 4 R., 2 B.; rep. from \* to end. 4th round: \*1 B., 1 R., 4 B., 1 R., 2 B., 2 R., 2 B., 2 R., 1 B. Rep. from \* to end. 5th round: \*2 B., 1 R., 2 B., 1 R., 2 B., 2 R., 4 B., 2 R. Rep. from \* to end. 6th round: \*1 R., 2 B., 2 R., 2 B., 2 R., 2 B., 2 B., 1 R. Rep. from \* to end. 7th round: \*1 R., 2 B., 2 R., 2 B., 2 R., 1 B., 1 R., 2 B., 1 R., 1 B., 1 R.; rep. from \* to end. 8th round: As 6th round. 9th round: As 5th round.

Cont. working backward (rounds 4, 3, 2, and 1) so that the 13th round will be as for the first round. Break off the coloured wools and cont. in N. only. K. in rounds until there are 10½in. from beg., fin. after a 3rd needle.

**Begin armhole shaping:** Slip last 5 st. of previous round and K. 5 st. of 1st needle on to a st. holder, k. 94 st., slip next 10 st. on st. holder. Work on last 94 st., using only 2 No. 10 needles. (Leave other stitches on spare needle for the present.) Now beg. with a p. row, work in st.st., dec. 1 st. each end of next 2 rows (90 st.). Cont. on these 90 st. until back measures 13in. from beg.

**Begin neck shaping:** Next row: K. 33, slip next 24 st. on st. holder, k. 33. Now work on last 33 st., leaving other stitches for the present. 1st row: P. until 2 st. remain, p. 2 tog. 2nd row: K. 2 tog., k. to end. 3rd row: P. to end. 4th row: K. 2 tog., k. to end. 5th row: P. until 2 st. rem., p. 2 tog. 6th row: K. to end.

Rep. these 6 rows 3 times more and work on rem. stitches straight until work measures 15½in., fin. at neck edge. Cast off 9 st. and leave other 8 st. on a spare needle. Rejoin wool to stitches left on st. holder and work this side to correspond. Join wool at needle point of front stitches and dec. 1 st. both ends of first 2 rows, and cont. in st.st. until work measures 12½in., then shape neck as for back and work straight until work measures 15½in. Shape shoulder as for back. Graft 8 st. at either side of shoulders tog.

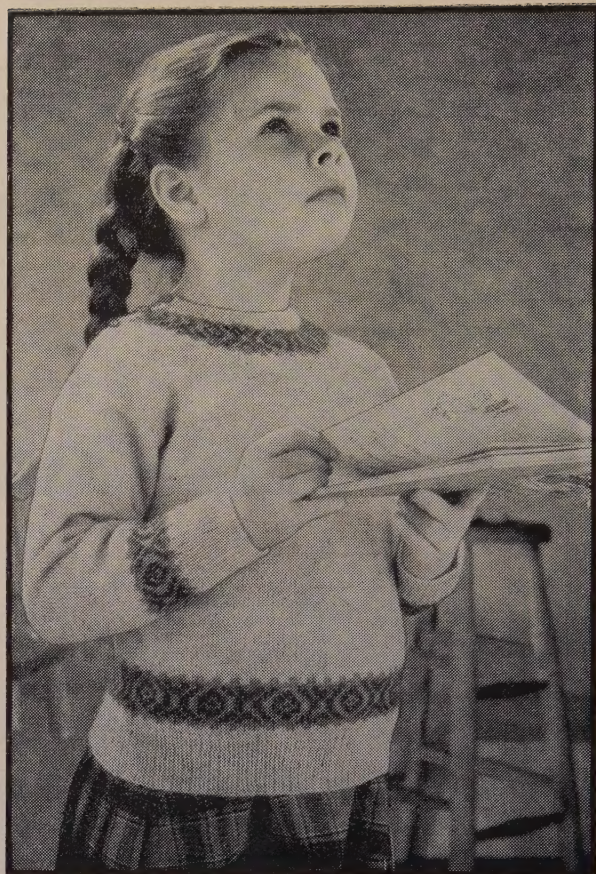
## The Sleeves

Now with the right side of the work facing, and using No. 10 needles, return to st. holder at armhole edge.

1st row: Slip 5 st. from st. holder on to a needle, k. them, then pick up and k. 72 st. all round armhole to other 5 st. left on st. holder and k. these (82 st.). Sew a piece of bright cotton at beg. of round as a guide for decs.

Work straight for 1½in., then dec. 1 st. at beg. and end of next round and every 9th round foll. until there are 64 st. Cont. without dec. for a few rows until work measures 19in. measured from picked up stitches. Change to Fair Isle pattern and work the 13 rows, then using No. 12 needles, k. 1 row, then work in k. 1, p. 1 rib for 2in. Cast off. Work the other sleeve in the same manner.

**The front neck band:** Using N. wool and No. 10 needles, and with the right side of work facing, beg. at left shoulder and pick up and k. 30 st. to st. holder, k. 24 st. from holder, then pick up and k. 30 st. up to right shoulder (84 st.). Next row: P. Join on coloured wools.



1st row: 2 Y., 2 G. to end. 2nd row: Using G. only, p. 11 (p. 2 tog., p. 18) 3 times, p. 2 tog., p. 11 (80 st.). 3rd row: K. \*1 R., 2 B., 2 R., 2 B., 1 R., 2 B., 4 R., 2 B. Rep. from \* to end. 4th row: P. \*1 B., 2 R., 2 B., 2 R., 2 B., 1 R., 4 B., 1 R. Rep. from \* to end. 5th row: K. \*2 B., 1 R., 2 B., 1 R., 2 B., 2 R., 4 B., 2 R. Rep. from \* to end. 6th row: P. \*1 R., 2 B., 2 R., 2 B., 2 R., 2 B., 2 B., 1 R. Rep. from \* to end. Change to No. 12 needles. 7th row: K. \*1 R., 2 B., 2 R., 2 B., 2 R., 1 B., 1 R., 2 B., 1 R., 1 B., 1 R. Rep. from \* to end. 8th row: As 6th row. 9th row: As 5th row. Cont. in this way, working backward to 2nd row. 12th row: Using G. only, p. 2 (p. 2 tog., p. 3) 15 times, p. 2 tog., p. 1 (64 st.). 13th row: K. 2 Y., 2 G., to end. Break off coloured wools. 14th row: P. in N. to end. 15th row: K. 1 (k. 2 tog., k. 2) 15 times, k. 2 tog., k. 1 (48 st.). Change to k. 1, p. 1 rib and work for ½in. Cast off in rib.

**The back neck band:** Using N. wool and No. 10 needles and with right side of work facing, beg. at right shoulder, pick up and k. 22 st. down to stitches left at centre, k. 24 st., then pick up and k. 22 st. up to left shoulder (68 st.). Next row: P. Join on coloured wools.

1st row: K. 2 Y., 2 G. to end. 2nd row: Using G. only, p. 9 (p. 2 tog., p. 14) 3 times, p. 2 tog., p. 9 (64 st.). Now work in Fair Isle pattern as for front until 12th row is reached. 12th row: Using G. only, p. 1 (p. 2 tog., p. 2) 15 times, p. 2 tog., p. 1 (48 st.). 13th row: K. 2 Y., 2 G. to end. Break off coloured wools. 14th row: P. in N. to end. 15th row: (K. 2 tog., k. 2) 11 times, k. 2 tog., k. 2 (36 st.). Change and work in k. 1, p. 1 rib for ½in. and cast off in rib.

## To Make up

Press work on the wrong side with a hot iron and damp cloth. Work 2 rows of d.c. along shoulder edges, either side, making three 3 ch. loops on front shoulder in the second row. Sew on 3 buttons each side to correspond with the ch. loops. Sew in all ends neatly and give a final press.



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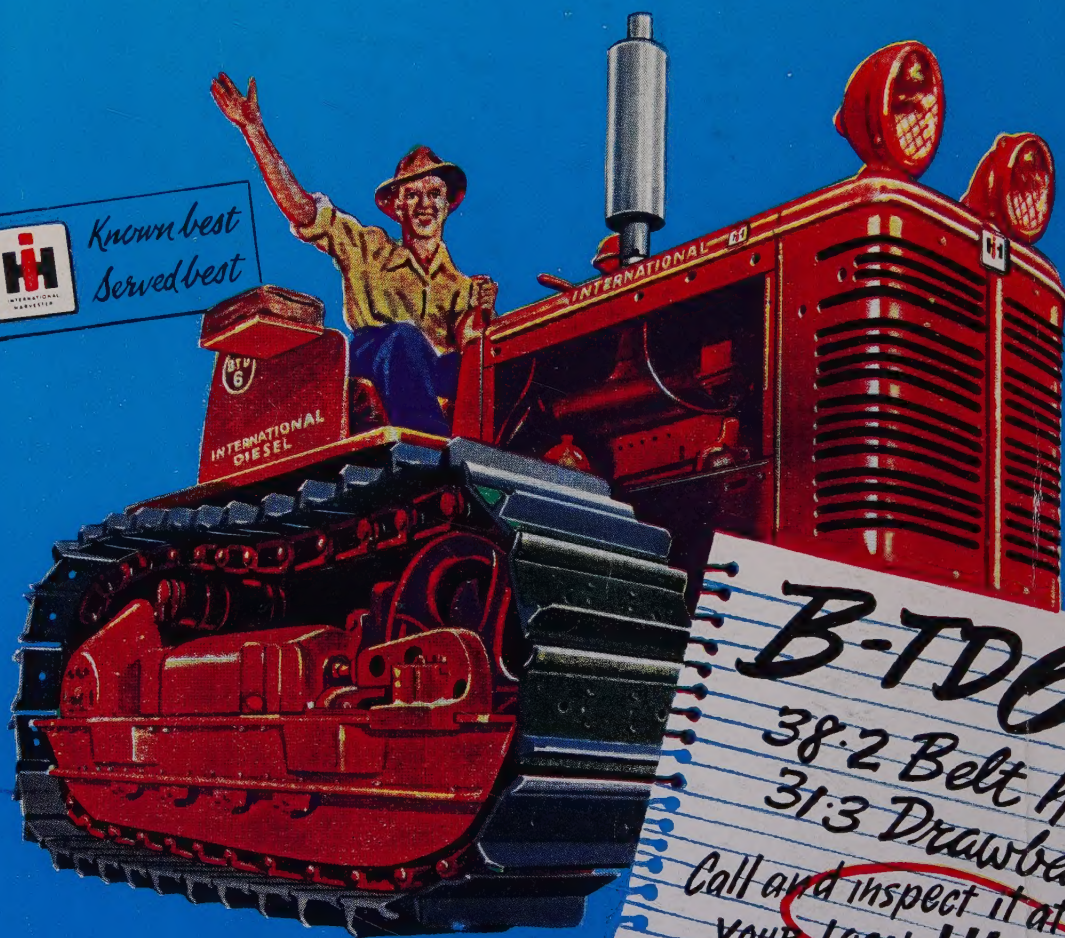
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